

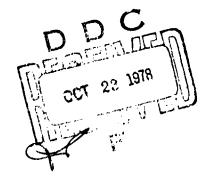
TRASANA

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FLIGHT PROFILE PERFORMANCE HANDBOOK

VOLUME III-AH-1G (COBRA)

Nathan H. /Cleek, Jr. Alan J. /Jolfe



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> DEPARTMENT OF THE ARMY US ARMY TRADOC SYSTEMS ANALYSIS ACTIVITY WHITE SANDS MISSILE RANGE **NEW MEXICO 88002**

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WARNING

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DEPARTMENT OF THE ARMY
US ARMY TRADOC SYSTEMS ANALYSIS ACTIVITY
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TRASANA

TECHNICAL REPORT NO. 3-78

FLIGHT PROFILE PERFORMANCE HANDBOOK

VOLUME III-AH-1G (COBRA)

PREPARED BY

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AUGUST 1978

DEPARTMENT OF THE ARMY
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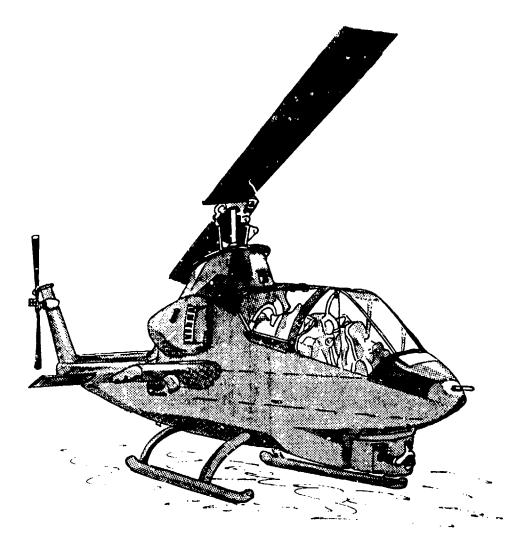
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AH-1G COBRA

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CHAPTER 3

INTRODUCTION

1. PURPOSE

The purpose for preparing this handbook series is fourfold: (a) to validate AH-1G performance data quickly, (b) to reduce the manpower and time to prepare accurate flight profiles, (c) to standardize performance data so that the analysis community can benefit from a single reference in conducting studies and (d) to provide a handbook that can be used for training in the mission profile planning area.

2. BACKGROUND

The AH-1G performance data contained in this Flight Profile Performance Handbook (FPPH) series was originally acquired as a data base for the Aircraft Mission Processing Simulation (AMPS) model. AMPS is a computer program developed by the Aviation Systems Analysis Branch of the US Army TRADOC Systems Analysis Activity (TRASANA) to support Cost and Operational Effectiveness Analyses (COEAs). AMPS generates detailed flight profiles for a wide variety of helicopter missions. The data was provided TRASANA by the Army Aviation Research and Development Command (AVRADCOM) and was the most accurate data available to AVRADCOM at the time of handbook publication. In structuring the data base for AMPS it was noted that the data, when properly organized, could provide a method of doing quick and simple flight profile simulations. This volume presents the AH-1G data and explains how it can be used.

3. OBJECTIVES OF THE HANDBOOK

- a. <u>Data Validation</u>. This volume of the handbook contains tables with the precise performance data and format required to develop flight profiles for computer simulations. Using the handbooks as a reference, the individual project manager (PM) will be able to quickly validate or update as required all associated data contained in the different tables. If this procedure is followed by the various PMs, support of Helicopter COEAs and other analyses can be efficiently implemented.
- b. Flight Profile Development. Much of the manpower and time spent in preparing flight profiles for supporting aircraft COEAs is dedicated to look-up, correlation and validation of performance data. Once the procedure contained in this handbook is implemented, flight profiles can be easily prepared. What normally took one man 4 to 5 days to prepare can now be prepared in 3 to 4 hours.

- c. Standardization of Performance Data. Each of the PMs has been contacted by AVRADCOM to validate the performance data contained in each handbook in this series. Once each handbook is published, the data contained will be kept current as of the publication date. Since the requests for current information are constantly being forwarded to the PMs by analysis groups, this handbook can be a reference and assure a commonality in studies within the community.
- d. Training for Planning Missions and Flight Profiles. For training purposes each handbook can stand alone. It is only a matter of following the example provided and applying the proper data to fit the flight profile desired. Although the example shown is simplistic, the methodology may be expanded to apply to any flight profile no matter how complex.

4. OTHER VOLUMES

This handbook is one of a series that covers the helicopters in the US Army inventory. The complete set of handbooks and their subjects are:

Volume I - FPPH Description

Volume II - UH-60A (BLACKHAWK)

Volume III - AH-1G (COBRA)

Volume IV - AH-1S (COBRA)

Volume V - YAH-64 (Advanced Attack Helicopter [AAH])

Volume VI - OH-58C (KIOWA)

Volume VII - CH-47 (CHINOOK)

Volume VIII - CH-54 (TARHE)

Volume IX - UH-1H (HUEY)

GENERAL HANDBOOK DESCRIPTION

a. Performance Data. The data contained in these volumes is AH-1G performance data compiled from the results of actual experiments. It is not engineering data and is not intended to serve as a base for future helicopter construction or acquisition. The more mature the helicopter becomes, the less likely there will be a change in the basic performance data.

b. Mandbook Organization. This volume is one of a series of volumes as identified in paragraph 4 above. Volume I is a description of the methodology used to develop the tables for each of the other volumes. This volume and all other volumes except Volume I provides a simplified flight profile example in Chapter 2. Chapter 3 provides an explanation of each of the five types of data tables contained in the handbook. The five types of tables deal with: (1) Basic Fuel Flow Data, (2) Delta Fuel Flow for Drag Data, (3) Ground Idle Fuel Flow Data, (4) Gross Weight Limits Data and, (5) Velocity Limits data. Chapter 4 contains the actual tables to be used for developing flight profiles.

CHAPTER 2

FLIGHT PROFILE EXAMPLE

1. GENERAL

This chapter provides an example of how to develop a flight profile, albeit simple, that can be extended to cover any number of stops, loads and distances all depending on helicopter capability and fuel available.

2. DISCUSSION

- a. The main question this example of a flight profile will answer is, "Do I have enough fuel to fly the proposed mission?"
- b. Suppose a pilot is to fly a simple support mission in an AH-IG helicopter that calls for flying (as shown in illustration 2-1) from point A (the air base), to point B (the holding area) to point C (the combat area) and return to A.

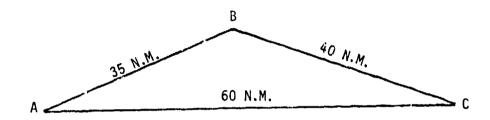


Illustration 2-1

c. The other information given is airspeed (AS) from A to B which is to be 70 knots (kts), from B to C 40 kts, and from C to A 60 kts. The AH-1G helicopter is to be flown at an ambient temperature of 15° C. The leg from A to B will be flown at 4,000 ft,* while legs B to C and C to A will be at 3,000 ft. The ground elevations at A, B and C are all 2,000 ft. The mission plan also shows 10 minutes idle at A before takeoff, 15 minutes idle at B, 20 minutes Hover in Ground Effect (HIGE) at C and 5 minutes idle on returning to A for shut-down. The AH-1G will take off with a gross weight (GW) of 9,500 lbs at A and continued to carry this weight until leaving C to return to A, then the GW will be 8,500 lbs.

^{*}All altitudes are in reference to sea level.

d. The flight plan is prepared by drawing up a table similar to Table 2-1 below. By filling in the blanks under fuel, it can be determined if the total is too large for the helicopter.

TABLE 2-1

Helicopter: AH-1G

Temperature: 15°C

LEG	DISTANCE N.M.	AS KTS	TI MIN	ME HR	GW LBS	ALT FT	FUEL LBS
Idle @ A	-	-	10	1/6	-	2000	
A - B	35	70	30	1/2	9500	4000	
Idle @ B	-	•	15	1/4	-	2000	
B - C	40	40	·60	1	9500	3000	
HIGE @ C	-	-	20	1/3	9500	2000	
C - A	60	60	60	1	8500	3000	
Idle @ A	-	-	5	1/12	-	2000	
						Total	

e. First fill in Idle @ A, Idle @ B, and 2nd Idle @ A since they will all come from Table 2-2. In each case the idle is at 2000 ft and a temperature of 15°C. Consulting the ground idle fuel shown in Table 2-2, the value of 374 lbs/hr is at the intersection of 2000 ft and 15°C.

1st Idle @ A = $1/6 \times 374 = 62$ lbs

Idle $\Theta B = 1/4 \times 374 = 94 \text{ lbs}$

2nd Idle $@A = 1/12 \times 374 = 31 \text{ lbs}$

TABLE 2-2

GRUUND IDLE FUEL FLOW AIRCRAFT - AH-16

		PRESS	PRESSURE ALTITHDE (FT)	HDE (FT)			
		SEA LEVEL	2000	4000	0009	80-0	, 6000
•	5 52-	680	371	353	336	318	300
FAFERA OKE) S=	148	37.5	355	337	319	106
	3 51	160	374	356	338	321	303
CENIIGRADE	3 5 €	342	375	358	l h E	67E	307

ENTRIES ARE AIRCRAFT FUEL FLOW RATES IN LBS/HR

TABLE 2-3

BASIC FUEL FLON
FUEL FLOW RATES FOR THE GIMEN CONDITIONS IN LBS/HR
PRESSURE: 4000 FT TEMPERATURE: 15 C
AIRCRAFT - AH-16

	160	185	7.87	613	837	38 75	923	1001
	140	523	635	643	h99	683	101	736
	120	521	523	538	551	567	585	5C 7
_	100	691	475	482	491	503	518	536
E (KTS)	80	439	555	452	461	474	489	507
HT MODE	0.9	431	439	6 † †	461	475	491	210
FLIGHT	04	644	461	474	489	506	526	543
	NOE	96 † .	517	540	565	593	623	658
	HOGE	543	512	605	541	679	720	762
	HIGE	495	519	544	570	599	629	551
GROSS	(182)	6+500	7 • 000	7,500	8 • 000	8+500	000•6	9•500

TABLE 2-4

BASIC FUEL FLOW
FUEL FLOW RAIES FOR THE GIVEN CONDITIONS IN LBS/HR
PRESSURE: 2000 FT TEMPERATURE: 15 C
AIRCRAFI - AH-16

	1.	_	١,,	,	۱,	,		_	1.				Γ		T							
		191	8.3	3	9 4 8		9 6	2	0	7 7 0	40.3		0 2 6	מעמ								
		7 # T	299		571		583)	200	ם ח	717		120	7								
	120	120	555		561		55.5		573		200		605	;	5 6 3							
<u></u>	00.	100	200		505		511		518		526		538		551							
	ng.	2	467		77 h		478		485	-	484		506		521							
	80		456	1.3.	 2 2 7		4 72		482		M G T		201	-	522							
FLIG			472	2 0 1	7 0 1		- - - - -		209		523				558							
						-	ļ	NOE	1	<u>त</u>	277	7		0.00		2/8		709	1	679		623
		0 2 2) ()	585	3	-	7		*	600	700	01.	n +	100	50.2							
	HIGE	210	040	533		557		503	300	202	3	313		100	C 2 0							
WEIGHTS	(182)	6 5 00		7 + 000		7 500		000.8		8 5 500		000 • 6		9 5 7 7	,							
	s	S HIGE HOGE NOE 40 60 80 100 120 1	S HIGE HOGE NOE 40 60	S HIGE HOGE NOE 40 60 80 100 120 140 510 550 555 662	S HIGE HOGE NOE 40 60 80 100 120 140 510 550 515 472 456 467 500 555 662	S HIGE HOGE NOE 40 60 80 100 120 140 510 533 585 534 483 464 472 505 505 561 571	S HIGE HOGE NOE 40 60 80 100 120 140 510 533 585 534 483 464 472 505 505 551 571	S HIGE HOGE NOE 40 60 80 100 120 140 510 53 585 534 483 464 472 505 515 517 557 557 557 557 557 557 557 55	S HIGE HOGE NOE 40 80 100 120 140 510 550 555 557 514 483 464 472 515 515 515 515 515 515 515 515 515 51	S HIGE HOGE NOE 40 80 100 120 140 510 550 555 557 514 483 464 472 505 511 552 557 557 555 662 557 557 555 667	S HIGE HOGE NOE 40 60 80 100 120 140 53 53 585 534 483 464 472 505 515 683 585 585 682 557 600 558 662 557 614 557 614 557 614 557 614 615 614 557 615 615 615 615 615 615 615 615 615 615	S HIGE HOGE NOE 40 60 80 100 120 140 150 140 153 585 534 483 464 472 505 518 518 518 518 518 518 518 518 518 51	S HIGE HOGE NOE 40 60 80 100 120 140 151 153 585 584 483 464 472 505 518 571 571 582 582 585 685 682 587 688 688 688 688 688 688 688 688 688 6	S HIGE HOGE NOE 40 60 80 100 120 140 140 510 550 555 562 557 614 555 447 500 555 551 652 557 657 557 657 614 614 615 557 615 614 614 615 557 615 614 614 615 615 615 617 614 615 615 615 615 615 615 615 615 615 615	S HIGE HOGE NOE 40 60 80 100 120 140 100 533 585 534 483 464 472 505 505 562 562 553 662 553 662 553 662 553 662 553 662 553 683 682 687 588 687 588 687 588 688 688 688 688 688 688 688 688 688							

Notice the conversion from minutes to hours. These values must be used because fuel flow is in lbs/hr.

f. The fuel flow for leg A-B of the mission is calculated next. This leg takes place at an altitude of 4,000 ft. and a temperature of 15°C. Thus the necessary information is contained in Table 2-3. Leg A-B is at 70 kts and 9,500 lbs. This is not one of the values given but 60 kts is 510 lb/hr and 80 kts is 507 lb/hr. Interpolation gives the value of 509 lb/hr for a 70 kts airspeed. Since the leg is a half hour long:

Leg A-B = 1/2 X 509 = 255 1bs

g. Leg B-C is calculated next. Since this takes place at a 3,000 ft. altitude, it is necessary to interpolate between Table 2-3 (4,000 ft) and Table 2-4 (2,000 ft). From Table 2-3 the value for 4,000 ft, 15°C, 40 kts and 9,500 lbs is 549 lb/hr. From Table 2-4 the value for 2,000 ft, 15°C, 40 kts and 9,500 lbs is 558 lb/hr. Interpolation gives the value of 554 lb/hr for a 3,000 ft altitude. Since the leg is one hour long:

Leg B-C = $1 \times 554 = 554 \text{ lbs}$

h. HIGE at C is calculated next. Since this occurs at 2,000 ft and 15°C the necessary value is found in Table 2-4. At 9,500 lbs, HIGE uses 665 lb/hr of fuel. Since the hover is one-third of an hour long:

HIGE @ $C = 1/3 \times 665 = 222 \text{ lbs}$

i. Leg C-A is the last calculation. Since it takes place at a 3,000 ft altitude, it is once again necessary to interpolate between values from Table 2-3 and Table 2-4. Table 2-3 gives a rate of 475 lb/hr for 4,000 ft, 15°C, 8,500 lbs and 60 kts. Table 2-4 gives a rate of 493 lb/hr for 2,000 ft, 15°C, 8,500 lbs and 60 kts. By interpolation, 484 lb/hr is the value needed. Since the leg is one hour long:

Leg C-A = 1 X 484 = 484 1bs

j. The flight profile can be finished by filling in Table 2-1 as shown in Table 2-5.

TABLE 2-5

Helicopter: AH-1G Temperature: 15°C

LEG	DISTANCE N.M.	AS KTS	TI MIN	ME HR	GW LBS	ALT FT	FUEL LBS
Idle @ A	-	-	10	1/6	-	2000	62
A - B	35	70	30	1/2	9500	4000	255
Idle @ B	-	-	15	1/4	-	2000	94
B - C	40	40	60	1	9500	3000	554
HIGE @ C	-	-	20	1/3	9500	2000	222
C - A	60	- 60	60	1	8500	3000	484
Idle @ A	-	-	5	1/12	-	2000	31
						Total	1702

- k. Although only three look-up tables were used for this example, each type of table has several conditions that are changed so that a wide band of performance parameters can be addressed. The discussion on each of the five types of tables is contained in Chapter 3. A succinct description of each of these five types of tables is:
- (1) Basic Fuel Flow Data: Gives the rate the aircraft uses fuel dependent on the given flight conditions.
- (2) Delta Fuel Flow for Drag Data: Gives the additional rate of fuel flow to be added to the basic rate for external drag.
- (3) Ground Idle Fuel Flow Data: Gives the rate fuel is used when the aircraft is on the ground with its engine running.
- (4) Gross Weight Limits Data: A check on whether or not the aircraft has enough lift to take off with a given weight.
- (5) Yelocity Limits Data gives the optimum (long range) speed and maximum rates of speed.

CHAPTER 3

PERFORMANCE DATA TABLE DESCRIPTIONS

1. GENERAL

This chapter describes each of the five basic type tables used for developing flight profiles. The variables within each type of table are described as well as how the specific data required can be extracted.

2. BASIC FUEL FLOW DATA

- a. The basic rate of fuel flow* is determined by five variables:
- (1) Type of aircraft
- (2) Altitude (Air Pressure)**
- (3) Temperature***
- (4) Gross Weight****
- (5) Flagat Mode
- b. In each table (see Table 3-1) within the basic type, the first three variables are held constant for the whole table, i.e., (a) Type of Aircraft, (b) Altitude (Air Pressure) above sea level, and (c) Temperature. These variables are stated at the top of each table.
- c. There are seven rows of fixed gross weights: 6,500 lbs to 9,500 lbs inclusive at 500 lb increments. The ten columns are fixed flight modes.
- (1) The first column is Hover In Ground Effect (HIGE). HIGE is used for hovers at a height of 2 feet or less and a component of forward flight 10 kts or less.
- (2) The second column is Hover Out of Ground Effect (HOGE). This is used for hovers at a height of more than 2 feet.

^{*}The basic fuel flow data represents a clean drag configuration with all doors closed, no wing stores, and no external sling loads.

^{**}All altitudes or air pressures are feet above sea level.

***For simplicity, all temperatures are considered to be the average

temperature in which the helicopter is operating (Degrees Centigrade).
****Total vehicle weight in pounds.

- (3) The third column is Nap of the Earth (NOE). This is defined as all flight for variable speeds from 0 to 40 kts and variable altitudes.
- (4) The remaining seven columns are for given airspeeds* (in kts) as the flight mode.
- d. There are 24 of these basic fuel flow charts. Each chart is for a different combination of Air Pressure (Altitude) and temperature.
- e. The Basic Fuel Flow Data is the main table used in simulating a flight profile. For example, assume a pilot's flight path will require 30 minutes of flight at 80 kts airspeed, 4000 ft. altitude, 15°C and a gross weight of 8,000 lbs in a AH-1G helicopter. Using Table 3-1 at a gross weight of 8,000 lbs and an airspeed of 80 kts, the helicopter will use 461 lbs/hr fuel, i.e., for 30 minutes, 231 lbs of fuel will be used.
- f. The gross weights values selected provide the basic range of load carrying capability for the ten flight modes of the AH-1G helicopter. Within the gross weight band shown, linear interpolation** is quite accurate for estimating the fuel flow rates.
- g. For example, using Table 3-1, if the helicopter's gross weight was 7,750 lbs and if the flight mode was 60 kts, the fuel flow cannot be found directly. But by interpolating between 60 kts, 7,500 lbs 449 lbs/hr and 8,000 lbs 461 lbs/hr, the basic fuel flow rate for 7,750 lbs is 455 lbs/hr. In this example, if the helicopter flies in this mode for 30 minutes, 228 lbs of fuel will be used.
- h. As altitude and/or temperature changes occur, different tables are used to look up the aircraft's basic fuel flow rate for each leg of the flight path. Care must be taken that the proper table is used.
- i. Appendix A contains a set of functions that will give a good approximation of the basic rate of fuel flow.
- 3. DELTA FUEL FLOW FOR DRAG DATA
 - a. The delta fuel flow for drag is also determined by five variables:
 - (1) Type of Aircraft
 - (2) Altitude (Air Pressure)
 - (3) Temperature
 - (4) Drag Surface (Equivalent Square Footage)
 - (5) Air Speed

^{*}All references to airspeeds are to true airspeeds.

^{**}All references to interpolation are linear interpolations. See FPPH, Volume I, Chapter 3 for a discussion on the accuracy of interpolation.

TABLE 3-1

BASIC FUEL FLOW
FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR
PRESSURE: 4000 FT TEMPERATURE: 15 C

-16
- AH-
IRCRAFT
AIF

		160	186	7.9.7	613	837	78.75	929	1001
		140	623	635	643	h 9 9	P 83	707	13E
		120	521	529	538	551	135	585	50.7
-		100	469	475	482	491	503	518	536
FILTER		80	439	† † †	452	461	474	684	507
FI TONT MODE		09	431	439	644	461	92 4	491	510
51 13		O fr	644	461	h 2 h	489	206	526	543
		NOE	96 †	517	540	565	593	623	656
		HOGE	543	212	605	149	679	720	762
		HIGE	561)	519	544	570	599	629	199
GROSS	CETCETC	(1881)	003+3	7,000	7*500	8 • 000	8 500	000+6	00546

TABLE 3-2

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG PRESSURE: 4000 FT TEMPERATURE: 15 C

AIRCRAFT - AH-16

				:	ŧ	l		
				AIK	K SPECD	JIN KTS	2	
		C a	60	03	100	120	140	160
DRAG	5.0	1	3	6	-	7	5.7	
ZH						;	,	7.5
SQUARE FEET	10.0	2	~	17	34	£9	116	190

- b. Like the basic fuel flow tables, there are 24 tables for delta fuel flow for drag.
- c. There are two fixed rows of equivalent square feet of drag: 5.0 equivalent sq ft and 10.0 equivalent sq ft.
- d. The seven columns are for airspeeds in kts of: 40 kts, 60 kts, 80 kts, 100 kts, 120 kts, 140 kts, and 160 kts.
- e. When an external load is placed on the helicopter, the amount of fuel consumed per hour increases. The delta fuel flow for drag tables indicate how much extra fuel consumption to add to the basic fuel flow rate.
- f. In the example given earlier, a 30 minute flight at 80 kts airspeed, 4000 ft altitude, 15°C and a gross weight of 8,000 lbs was used. Using the basic fuel flow tables, the basic fuel flow rate was 461 lbs/hr. Assuming for this new example that part of the load is external and inducing a 5.0 equivalent sq ft external drag, the delta fuel flow for drag (Table 3-2) shows 9 lbs/hr should be added to the basic fuel flow rate. Thus the basic fuel flow rate becomes 461 + 9 or 470 lbs per hour and for a half-hour flight, 235 lbs of fuel will be used instead of the 231 lbs figured without an external load.
- g. Appendix B contains a function that will give a good approximation of the delta fuel flow for drag.

4. GROUND IDLE FUEL FLOW PATA

- a. The ground idle tuel flow rate is determined by only three variables:
 - (1) Type of Aircraft
 - (2) Altitude (Air Pressure)
 - (3) Temperature
- b. There is only one ground idle fuel flow table (shown as Table 2-2). The table has four rows of temperatures: -25°C , -5°C , 15°C and 35°C , and six columns of altitudes: Sea Level, 2000 ft, 4000 ft., 6000 ft., 8000 ft., and 10000 ft.
- c. The ground idle fuel flow table is used as discussed in the example flight profile in Chapter 2 (Table 2-2). The AH-IG helicopter idling for 20 minutes at 2000 ft. altitude and 15°C, (across the row labeled 15°C and down the column labeled 2000) find the intersection at 374. Thus, the AH-IG uses 374 lbs/hr at these conditions and since it is idling for 20 minutes or 1/3 of an hour, it will use 125 lbs of fuel.

- d. If the helicopter had only been 1000 ft. above sea level, the consumption rate would be found by interpolating between the sea level rate of 391 lbs/hr and the 2000 ft. rate of 374 lbs/hr which would be 383 lbs/hr. In 1/3 of an hour 128 lbs of fuel would be used.
- e. Appendix C contains a function that will give a good approximation of the ground idle fuel flow.

5. GROSS WEIGHT LIMITS DATA

- a. Gross weight limits tables are intended to show whether or not the aircraft can safely take off for four sets of criteria. These criteria are defined in the following paragraphs:
- (1) Criteria #1 is based on the helicopter using 100% of Maximum Power for take off and having enough power to lift straight up and above ground effect (See Figure 3-1). Once it is in hovering above ground effect level the helicopter begins forward flight until it acquires, transitional lift and is able to climb at 450 ft/min (a desired standard rate of climb) to the desired altitude. This criteria has some risk since the pilot has no reserve power. It has less risk than Criteria #3 but more than Criteria #2 thus it is considered to be "Middle of the Road" risk.
- (2) Criteria #2 (Figure 3-1) is based on the helicopter using 95% of Maximum Power for take off and enough power to immediately begin to climb at a rate of 450 ft/min. This is the least risky criteria since the pilot has power in reserve and is still able to climb at a satisfactory rate.
- (3) Criteria #3 (Figure 3-1) has the most risk. Using 100% of Maximum Power the helicopter will only hover in ground effect. Therefore, at an altitude of 2 feet or less, the pilot must begin forward flight and gradually increase airspeed to acquire transitional lift to climb. The reasons for its high risk are readily apparent. First, there is no power in reserve. Second, the pilot must begin forward flight at a very low altitude.
- (4) Criteria #4. Structural Gross Weight Limits is the total upper limit of gross weight the helicopter can carry under any take off criteria.
 - b. Gross Weight Limits are determined by four variables:
 - (1) Type of Aircraft
 - (2) Criteria Chosen
 - (3) Altitude (Air Pressure)
 - (4) Temperature

CRITERIA :

(MIDDLE OF THE ROAD)

107% MAX POWER, HOGE

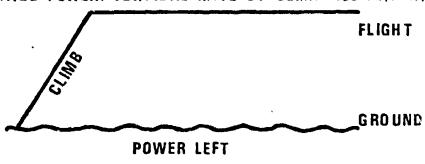
FLIG

HOGE CLIMB FLIGHT

ROTHING TO SPARE.

CRITERIA #2 (LEAST RISKY)

95% OF RATED POWER. VERTICAL RATE OF CLIMB 450 FT/MIN, HOGE



CRITERIA #3
(MOST RISKY)

100% MAX POWER, HIGE

TRANSITIONAL LIFT CLIMB
HIGE GROUND
NOTHING TO SPARE.

Figure 3-1

- c. Additionally, Criteria #1, #2, and #3 differ due to engine power limits or transmission power limits of the aircraft. Thus there are six tables:
 - (1) Criteria #1 (Due to engine)
 - (2) Criteria #1 (Due to transmission)
 - (3) Criteria #2 (Due to engine)
 - (4) Criteria #2 (Due to transmission)
 - (5) Criteria #3 (Due to engine)
 - (6) Criteria #3 (Due to transmission)
- d. The structural gross weight limit is a single value for each helicopter and is only dependent on the type helicopter. The AH-IG structural gross weight limit is given as 9,500 lbs and is listed at the bottom of each table. As the name implies, it is simply not safe to expect the AH-IG structure to maneuver normally when the total weight is larger than that value.
- e. In simulating inflight profile, the gross weight limits tables are used to check whether the aircraft is going to be too heavy to take off under the given conditions. As an example, assume an AH-1G pilot planned a mission that called for using take off criteria #1 and the take off was to be at 6000 ft., 15°C, and a gross weight of 8,300. Three checks would be required: First, does this gross weight exceed the structural gross weight limit? Second, does it exceed Criteria #1 (due to transmission)? Third, does it exceed Criteria #1 (due to engire)? In the example given, the answer to all three questions is "No", the take off will not exceed aircraft limits. (Tables 3-3 and 3-4)
- f. If the assigned gross weight had been 8,500 lbs, it would have exceeded the value given for 6,000 ft. and 15°C at Criteria #1 (Due to engine). (Table 3-3) The mission could not be flown as planned. The plan could be changed, for example to take off at 4000 ft. (which might not be practical) or change to take off Criteria #3 (which is more risky but has higher limits).
- g. If the assigned gross weight had been 9,700 lbs., it would have exceeded the structural limits. To perform the mission the only choices would be to lighten the load or get another type helicopter.
- h. Appendix D contains a set of functions that will give a good approximation of the gross weight limits for takeoff.

TABLE 3-3

100% OF MAXIMUM POWER KHOGE) FOR TAKEOFF CRITERIA #1 GROSS WEIGHT LIMITS (DUE TO ENGINE)

AIRCRAFT - AH-16

			ď	PRESSURE ALTITUDE (FT)	TITUDE (F	13	
		SEA LEVEL	3332	0001	90,50	8000	10000
TENCTOA 11100	-25 C	13521	12582	11704	10856	1 006 3	9322
יבון באא וסאני	-5 C	12128	11275	10440	9698	8958	8561
CENTES PRE	15 C	1921	9762	9019	8338	7708	7038
CENTAGANDE	35 C	8766	8143	7530	5382	6394	5908

ENTRIES ARE AIRCRAFT GROSS WEIGHTS IN LBS

STRUCTURAL GROSS WEIGHT LIMIN: 9.500 185

TABLE 3-4

GROSS WEIGHT LIMITS
(DUE TO TRANSMISSION)
FOR TAKEOFF CRITERIA #1
100% OF MAXIMUM POWER (MOGE)
AIRCRAFT - AH-16

•			ā.	RESSURE A	PRESSURE ALTITUDE (FT)	FT}	
		SEA LEVEL	2000	0004	. 4009	B008	1 0000
TEMBERATION	-25 C	9820	9632	04;46	9251	.90E1	8865
סבים ביים ביים ביים ביים ביים ביים ביים	J 5-	8195	9431	9245	950E	886.6	8550
CENTTEDANE	15 C	8633	9250	9066	8872	8678	6 7 7 8
	35 C	9264	9083	8897	8755	84 21	8229

ENTRIES ARE AIRCRAFT GROSS WEIGHTS IN LES

STRUCTURAL GROSS WEIGHT LIMIT: 9.500 LBS

6. VELOCITY LIMITS DATA

- a. There are various types of data given in these tables but like the gross weight limits tables, they are primarily restraints on what can be expected of a helicopter in planning a mission profile. Velocity limits tables are influenced by five variables:
 - (1) Type of aircraft
 - (2) Air pressure (altitude)
 - (3) Temperature
 - (4) Gross weight
 - (5) Condition or limit
- b. Items (1) through (4) are self-explanatory. There are five types of information that can be listed under (5):
 - (1) Long range
 - (2) Maximum continuous power
 - (3) Maximum power (due to engine limits)
 - (4) Transmission limits
 - (5) V_{ne}(velocity never exceed)
- c. For each aircraft, there are 24 Velocity Limits Tables depending on air pressure and temperature combination. Table 3-5 is an example of the content of the Velocity Limits Table.
- d. The two columns under Long Range (Table 3-5) give the optimum speed and fuel flow for each set of variables #1 through #4 above. Thus the AH-1G helicopter operating at 2000 ft., temperature 15° C, and having a gross weight of 8,000 lbs will fly a longer distance if the velocity is kept at 132 kts and will use 642 lbs/hr of fuel at that velocity.
- e. Maximum continuous power gives the fastest speed at which a helicopter can fly for long periods (30 minutes or more) and the associated fuel flow rate. An example from Table 3-5 would be an AH-IG helicopter at 2000 ft. and 15° C weighing 8,000 lbs could fly 144 kts with a fuel usage of 731 lbs/hr.

TABLE 3-5

VELOCITY LIMITS TABLE (INCLUDING FUEL FLOW RATES)
PRESSURE: 2000 FT TEMPERATURE: M5 C

AIRCRAFT - AH-16

_	_		سے صحبت							
DEVENOUS NEVER	EXCEED	F.F. (LBS/HR)		1109	1116	1125	1143	1180	1252	1353
100	E	VEL (KTS)		187	187	187	187	187	187	187
TOFNICATOR	LIMITS	63H/S87)	V j⊭	614	739	739	739	739	739	739
70% 401	LIV	VEL (KTS)		051	8 % 1	241	145	147	141	138
> 42	I K I K I NE J	(F.F.		181	181	731	181	78.1	781	781
Š	POWER (ENGINE)	VEL (KTS)		154	153	152	150	148	146	143
>	INUOUS	F.F. (L8S/HR)		121	131	181	131	131	731	731
2	CONTINUOUS	VEL (KTS)		8#1	8 h I	967	h tı T	142	140	137
0.00	RANGE	TL F.F.	·	979	2£9	635	249	h 5:3	670	690
-	3 &	(XTS)		ካ ይ ፒ	h£I	133	132	281	132	132
		,	GROSS WEIGHTS (LBS)	8 500	7 + 000	7 • 500	8 • 000	8•500	9+000	9, 500

24

- f. Maximum power (Ingine and transmission limits) show the maximum speeds the aircraft can structurally attain for short periods of time (less than 30 minutes). Thus the AH-IG helicopter at 2000 ft and 15°C weighing 8,000 lbs has an engine that is capable of producing enough power to fly 150 kts but the transmission limits the aircraft to 145 kts. Between these two columns then, the flight cannot exceed 145 kts with a fuel flow rate of 739 lbs/hr.
- g. There is another limiting factor called Vne (velocity never exceed). This velocity limit is determined by helicopter structural considerations. Vne's for the AH-IG are used as limits. That is, the structure limits the aircraft to that maximum velocity.

7. DETAILED FLIGHT PROFILE USING ALL PERFORMANCE DATA TABLES

The example of a Flight Profile in Chapter 2 was intertionally simplified to assure clarity. The description of the various to les in this handbook, however, indicates a more complex set of considerations are normally encountered in developing the flight profile. With the description provided in this chapter, additional information should be included in the flight plan beyond that shown in the example and a suggested format is provided below in Table 3-6.

TABLE 3-6

Helicopter: Altitude: Temperature:

			<u> </u>		<u></u>	<u>.</u>	
LEG	DISTANCE	AS	CHECK VELOCITY LIMIT	TIME	GW (LBS)	DRAG	FUEL
		·					
						·	
							·

Needed for each take off: Weight at take off: Type of take off: Check transmission limits: Check engine limits: Check structural gross weight limit:

CHAPTER 4

COBRA (AH-1G) PERFORMANCE DATA TABLES

GENERAL

The following tables are the major information presented in this hand-book. If the procedure for using them is understood, a flight profile for the COBRA (AH-IG) helicopter can be prepared in a matter of a few hours. The performance data contained have been reviewed for accuracy and are corrected to the best of our knowledge. The tables are organized in the following manner:

Tables 4-1 to 4-24

Basic Fuel Flow Data

Tables 4-25 to 4-48

Delta Fuel Flow for Drag Data

Table 4-49

Ground Idle Fuel Flow Data

Tables 4-50 to 4-55

Gross Weight Limits Data

Tables 4-56 to 4-79

Velocity Limits Data

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BASIC FUEL FLOW DATA
TABLES

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TABLE 4-1

BASIC FUEL FLOW
FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HY
PRESSURE: SEA LEVEL TEMPERATURE: -25 C

AIRCRAFT - AH-10

	160	1098	1123	1148	1173	1199	1225	1255
	140	BC4	817	832	847	865	384	505
	120	631	644	1652	099	599	613	651
-	100	553	559	999	571	578	585	593
E (KTS)	80	201	508	514	520	525	533	540
HT MODE	09	478	485	492	200	208	517	526
FLIGHT	10	485	495	202	216	528	240	553
	NOE	51.5	534	225	210	290	611	634
	HOGE	549	573	298	624	6 52	289	116
	HIGE	56 5	515	538	095	584	609	635
GROSS	(587)	6,500	7.000	7,500	8•50:0	8+500	9•00	9•5GC

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TER F A-2

BASIC FUEL FLOW
FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR
PRESSURE: SEA LEVEL TEMPERATURE: -5 C

AIRCRAFT - AH-16

		160	3	926		21.6		963		1005	4	1024		1646		1072
		140		740		5 20		159		171		587		199		RIG
		120		£ 08		10	1	מלכת		129		636		9 4 6		658
_		100		240	CLE	0.00	69.5	0		900	Test	296		268	1	578
FLIGHT MODE (KTS)		90	1) n	503		600	200		* 10	0000	מכת	1.00	170		5 36
HT MOD		60	00.2	100	A R.C.		404		F () 1	1	212	040	535	7 7 7	1.	100
FLIG		0	100		501		512		523		635		242		200	706
		NOE	527		544		295		581		602		528		CSD	 > >
	2001	HUBE	564		587		219		629		670		702		738	
	עדפר	HIGE	511		555		200		578		603		628		655	
GROSS	(LAC)		6,500	7.000		2.500		000.0			ממנים	200	מים מים		00546	

TABLE 4-3

BASIC FUEL FLOW
FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR
PRESSURE: SEA LEVEL TEMPERATURE: 15 C

AIRCRAFT - AH-16

		163	889	900	808	926	935	955	985
		146	104	712	121	733	346	761	118
		120	5.51	597	603	610	62C	631	349
		100	533	538	543	549	555	195	574
	MODE TRIS	C 8	164	503	508	513	520	573	540
2 2 2 1 1 1	5H1 MOI	09	18 th	164	85 t	507	516	125	245
FLIGHT	1774	C tr	86 4	5D8	519	531	544	558	574
		NOE	123	554	573	965	919	153	66:7
		HOGE	577	601	627	656	688	723	760
		HIGE	123	6 4 5	215	595	620	9 19	ħ 1 9
GROSS	KEIGHTS	(LBS)	035•9	7.500	7,500	0.00 • 8	8 5 50	000´•6	9.500

TABI F 4-4

BASIC FUEL FLOW
FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/PR
PRESSURE: SEA LEVEL TEMPERATURE: 35 C

,,,		_	т		_	_	_	_			_	-	٠.		_
				818	.87¢		831		841		8 5 8		952	2	010
		1 100	\perp	0.29	676		583		969		7.05		710		736
		125		2/10	585		588		50 10 11 11		# C 9		515		831
	-	100	2.30	263	533		538		543		551		195		573
34.77	HUDE (RIS)	90	00.4	733	504		503		518		523		534		548
- 1		09	4 40	?	487		505		514		525		538	ı	552
Fr TOUT	177	9.0	506		216		278	T.	247		200		1.4		23
		NOE	548		2.6.6		b D D			1300	025		100		680
		HOGE	590		C 7 9	6.75	2 10	26.2	<u>.</u>	100	2	76.3	7 + 7	. 0 6	7 3
		HIGE	542	200	200	500	B	612	7 7 0	617			• 00	602	750
GROSS	LEIGHTS L	(LBS)	6,500	7.000	200	7.500		8•000		8 • 500		<u> </u>		9.500	

TABLE 4-5

BASIC FUEL FLOW
FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR
PRESSURE: 2000 FT TEMPERATURE: -25 C
AIRCRAFT - AH-1G

				- 1		_		
	160	"	1069	1094	1119			_1
	140	160	77.6	790	807	927	BSI	8.75.
	120	5.00	909	615	824	636	547	5.6.2
-	100	520	526	532	539	546	555	564
E (KTS)	80	472	473	484	4 90	497	505	514
HT MODE	9	450	458	465	474	483	493	504
FLIGHT	04	460	470	481	493	505	519	534
	NOE	96 4	514	532	255	574	598	624
	HOGE	533	557	583	219	643	878	715
	391K	479	105	125	848	5/73	009	828
GROSS	(LBS)	6.500	7 • 000	7,500	8 • 000	8 5 00	000.6	8+500

TARIF 4-6

BASIC FUEL FLOW
FUEL FLOW RATES FCR THE GIVEN CONDITIONS IN LBS/FR
PRESSURB: 2000 FT TEMPERATURE: -5 C

	160	904	025	937	956	979	1009	1049
	5	969	306	718	132	241	165	787
	120	571	577	584	593	603	616	632
	100	205	512	815	524	532	541	552
(KTS)	08	468	473	479	485	4 92	501	513
FLICHT MODE (KTS)	09	452	459	467	4.76	486	497	511
FLICH	0,	995	476	488	200	513	528	544
	NOE	206	523	543	195	588	6 113	641
	HOGE	246	571	598	629	299	683	137
	HIGE	495	517	541	585	591	618	2 59
GROSS AFTGHTS	15871	6+500	7•000	7.500	000 • 8	8,500	9•00a	9+500

The state of the s

TABLE 4-7

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BASIC FUEL FLOW
FUEL FLOW RAIES FOR THE GIVEN CONDITIONS IN LBS/HR
PRESSURE: 2000 FT TEMPERATURE: 15 C
AIRCRAFI - AH-16

- 17		_	_	_			_			1	_	_	_	
		163	200	000	948	857		872		\$6.R.		979		411
		1 4.0	653	300	671	683		969		111		729		151
		120	5.55		199	595		578		55C		605		623
	•	100	500		202	511		218		526		538		551
	LETCHI HODE (RIS)	80	467		4 %2	478		485		4 G 4		206		521
77		09	455		#9	472		482		n 3) 3		705		522
51 15	977.	0,4	472		583	495		503	200	272		240		558
	į	NOE	515	77 % 2	924	5.25		B / C	603	100	630	670		7i C O
		390H	558	202	0.00	t19		710	502	1	710	n •	200	201
		HIGE	210	572	000	221	502	796	FOR		515		222	000
GROSS	NEIGHTS	(182)	6+500	7.000		7.500	8.000		8,500		00006		9.500	

TABLE 4-8

BASIC FUEL FLOW
FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR
PRESSURE: 2000 FT TEMPERATURE: 35 C

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GROSS				FLIG	HT NOD	FLIGHT NODE (KTS)	_			
•	HIGE	HOGE	NOE	0	9	80	100	120	140	160
	525	272	528	78 h	462	468	495	541	529	7.65
	548	600	545	164	4 70	473	500	145	637	113
	212	631	268	504	479	4 80	506	554	249	7.84
	557	665	585	519	26 ts	489	514	5.64	629	802
	624	701	618	535	504	500	524	511	673	8 30
	653	739	647	554	519	514	537	552	680	869
	584	780	878	576	537	530	553	611	714	923

TABLE 4-9

BASIC FUEL FLOK
FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR
PRESSURE: 4000 FT TEMPERATURE: -25 C
AIRCRAFT - AH-15

		150		993	0.0.	8 707	2002	2	1071	1	1104		1143		1.193
		C 77 C		119	3.6		152		773		796		823		E SR
		120		200	512		581		269		605		229		* * * * *
		100	100	n o P	495		201		509		870		870	1	7 7 7 7
FLIGHT MODE (KTS)		80	404	•	4.50		456		£ 63	1	7.7	10.0	701	100	- C
HT HOD		09	425		433		~ * * * * * * * * * * * * * * * * * * *		200	1,53	700	267	,	447	
FLIG		<u> </u>	437		448	4. 5.5	n n	64.4	7	2 R.F.	?	105		519	
	1011	MUE	114		496	F. F.	9 7 7	22.5	2	563		1065		619	
	HOSE		518	7. 2	* F O	513		n 09		019		678		717	
	HTGF		0 2 3	0.00	0	512		538		565		535	-60	623	
GROSS FIGHTS	L.821	200	2	1.000		7 500		0000	000	70040	denim -	-	9.500		-
9 13	_					_	1	o 	ľ	0	1	`	٥	`	

TABLE 4-10

BASIC FUEL FLOW

FUEL FLOW RAIES FOR THE GIVEN CONDITIONS IN LBS/HR
PRESSURE: 4000 FT TEMPERATURE: -5 C

	100 120 140 160	476 536 656 855	481 543 668 871	488 552 682 890	495 1563 698 915	505 517 717 347	517 593 739 991	
E (KTS)	80	439	445	451	459	469	481	107
FLIGHT MODE	09	427	435	443	454	466	78 th	30.0
FLIG	0.3	244	454	466	479	495	512	5.21
	NOE	489	506	527.	551	517	503	636
	HOGE	530	558	588	622	660	669	740
	HIGE	084	504	528	554	285	611	542
GROSS	(587)	005 49	7+000	7.500	000 * 8	8 500	00046	9.500

TABLE 4-11

BASIC FUEL FLOW
FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/H?
PRESSURE: 4000 FT TEMPERATURE: 15 C

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160	786	F	m	-		6	T
	=	7.62	813	837	38 75	929	1001
140	623	538	643	199	683	707	136
120	521	529	538	551	195	585	66.7
100	691	475	482	491	503	518	536
80	439	777	452	461	<b>b</b> <u>i</u> <b>b</b>	489	507
09	431	439	644	194	51 h	491	516
O h	ទីប្តង	461	4 7 i	684	206	929	549
BON	. 496	215	240	595	593	623	959
390H	543	215	605	T 49	679	720	291
HIGE	495	519	544	570	599	629	661
(182)	6 • 5 ± 0	7.000	7.500	8 • 000	8 - 500	9.600	035 · 8
	HIGE HOGE NOE 40 60 80 100	HIGE HOGE NOE 40 60 80 100 120 495 495 543 .496 449 431 439 469 521	HIGE         HOGE         NOE         40         60         80         100         120           495         543         .496         443         439         459         521           519         572         587         461         439         444         475         529	HIGE         HOGE         NOE         40         60         80         100         120           \$495         543         486         449         439         469         521           519         572         517         461         439         444         475         529           544         605         540         474         449         452         538	HIGE         HOGE         NOE         40         60         80         100         120         140           \$495         543         4496         449         433         459         521         623           519         572         587         461         439         444         475         529         535           544         605         580         474         449         452         538         649           570         641         565         489         461         461         461         61         654	HIGE         HOGE         NOE         40         60         80         100         120         140           \$195         \$43         \$43         \$43         \$45         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52         \$52	HIGE         HOGE         NOE         40         60         80         100         120         140           \$19         543         449         439         469         523         523         523         623           519         572         527         461         439         444         475         529         535         635           544         605         540         474         449         452         538         649         659         654         654         654           559         679         555         489         461         461         491         553         564         664         664         664         664         664         664         664         664         664         664         664         664         664         664         664         664         664         664         664         664         664         664         664         664         664         664         664         664         664         664         664         664         664         664         664         664         664         664         664         664         666         666         666         666

TABLE 4-12

FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR PRESSURE: 4000 FT TEMPERATURE: 35 C

	160	f 18	129	7:48	1778	821	8 82	977
	140	592	602	613	628	542	673	703
	120	808	515	525	535	555	574	599
-	100	494	470	479	489	503	520	545
MODE (KTS)	08	0 4 4	948	455	467	482	864	518
HT MOD	09	436	948	457	471	487	505	929
FLIGHT	0.3	456	469	181	501	520	544	572
	NOE	207	529	553	580	809	249	873
	HOGE	557	588	622	623	869	746	785
	HIGE	503	533	695 (	286	615	959	619
GROSS	(LBS)	6 • 500	7 000	7.500	8,000	8,500	00046	005.6

TABLE 4-13

BASIC FUEL FLOW
FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR
PRESSURE: 6000 FT TEMPERATURE: -25 C
AIRCRAFT - AH-16

		150	704	24.55	6.6		865		1032		1074		1128	)	1 1 0 5
		5	1	7294	BE		120		5 11 6		112		50 B		192
		120	١	3 S C	240		551		565		5.63		1909		5 2 3
	<u>.</u>	100	1 2 0	n n	994		4 7 3		285				3 C S		525
	A CKIST	80			h2:b	l	# 3 I		F 0 F		20.		± 0 ±		481
•	on a dude	09	402		014	1	7. 7	4	2	I	7 * *	100	200	1	37 -
1	LETONI	<b>1</b>	416		124	011	) r	I	7	106 1	3	1000	00,	200	200
		NOE	4 60	.	Ω 9+	203		200		555		703	5		C 7 0
		390H	505		# T	SEE		5112		54.1	5	F RIT	) )	۱	1771
		HIGE	453		7	503		530		559		1165		563	3 .
GROSS	KEIGHTS	(LBS)	005+9	יישעי		005 1		000.8		8 500		000.6		9 5 60	) ! }

TABLE 4-14

BASIC FUEL FLOW
FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR
PRESSURE: 6000 FT TEMPERATURE: -5 C

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		-	150		808		828		2 58	}	200	0	9 7 5	7	800	) )	1078
			G 7	-	620		634		650		670		693		1221		757
			12C		204		570		575		535		556		5 78		603
	٦	ı	100		- T		200		70		4 / 1		+ 0 +		חחכ		179
1	MODE (KTS!)		) B	412	7	0 0	-	427		26.37	201	4.5.1	101	1 2 2	0	2011	00,
	HT MOD	133	9	403		215		423		72.77	7	450	)	1,67		485	
	FLIGHT	40	?	421		433		<b>255</b>		463	)	480		201		526	
		NOE		694		70.5		676		245		571		1109		635	1
		HOGE		879	200	0	603	200		179		199		701		7 7 7	1
		HIGE	001	000	667		9 5	;	79.5	0		9/6	1000	000	1043	710	
68055	de ighis	15831	00549		2000		7 503		8 000		8 500		000 • 6		9,500		

TABLE 4-15

BASIC FUEL FLOW
FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR
PRESSURE: 6000 FT TEMPERATURE: 15 C

		150		740		156	30.	101		228		BB1		961		1077
		140		583	-03	CDO	610	670	36.5	ממת		189		969		73.9
		1:20			200		513	)   	530			27 27 0		5/5		209
_	- 1	100		7 # #	44		457		470	·	100	905		906	†	150
MODE (KTS)		80	4.13	771	4 20		430		443		1650	1	1.7.7	-	007	430
		09	407	)	875		430		444		461	•	UET	3	503	
FLIGHT	9,	2	428		Tbb		456		<b>↑</b>				519	)	550	
	NOE	110 E	480		503	1	976	1000	300	1	286		E21		629	
	HOGE		531	7.00	# QC	200		623	0.70	000	מממ		723		768	
	HIGE		481	E0.3		522		55.2	1	507	2		622		199	
GROSS WEIGHTS	(1881)	503	00040	7.000		7.500		000.0		8,500		0000	000	0.5.0	מו פונה	

TABLE 4-16

BASIC FUEL FLOW
FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR
PRESSURE: 6000 FT TEMPERATURE: 35 C

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	160	219	969	121	174	842	558	1156
	140	558	5.70	585	909	633	919	147
	120	478	88 4	205	515	539	135	610
6.	100	437	445	426	4 70	489	513	246
MODE (KTS!)	80	57.5	423	436	451	468	684	517
HT MOD	99	414	425	439	456	474	497	526
FLIGHT	04	436	451	468	488	512	543	585
	NOE	491	213	245	212	909	945	269
	HOGE	946	580	617	857	700	746	199
	HIGE	495	520	548	577	609	643	680
GROSS	(1821)	6.500	7 • 000	7.500	8•000	8•500	9,000	9+500

TABLE 4-17

BASIC FUEL FLOW
FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HY
PRESSURE: 80C0 FT TEMPERATURE: -25 C

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				140		6 # 3		0/9		<b>69</b>		723		755		700	133	1
			L	120		TOC		71c	3	326		246		570		598		070
				DC: 1	627	136	460	2 4 5	9 4 5	ח ר		196		476		495		510
	MODE CKTCS		6	QB	201		400		000		00.7	724		400		452	1	£ 43
	FLIGHT MODI		Cu	3	380		390		401		10 1 10		11.20	163	1	2 + t		200
			9		398		בת מיד	T	1 b Z b		C 7 7		2 7 2		100	101	503	
			NOE		05 +	ALEO	000	100	t n		525		551		5.84		619	7
			HOGE	1011	7.33	528		554	7	100	\$ C \$		643		685		731	
		UTAL	HIVE	上市林		694		496		503	975		755		290		624	1
00000	KFTGHTC I	(LBS)		6 • 5 00		00001		7,500		8 • 000		2000	200	040.0	0000	2	20260	
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TABLE 4-18

BASIC FUEL FLOW
FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR
PRESSURE: 8000 FT TEMPERATURB: -5 C
AIRCRAFT - AH-16

GROSS				FLIGHT	HT MODE	E (KTS)	_			
(182)	HIGE	HOGE	NOE	0.4	29	90	100	12C	140	160
6 • 500	457	509	954	402	382	389	420	476	588	168
7,000	483	244	08 h	91,	393	397	428	467	<b>†09</b>	794
7,500	511	585	507	432	405	80 h	439	205	628	930
8 • 000	145	622	536	450	421	422	453	521	649	881
8•500	574	h99	568	472	438	439	07 ti	543	613	8 4 8
9,000	609	707	603	4 98	459	458	492	5 7C	118	1037
9 500	<b>ት</b> ተያ	756	5 59	531	483	482	520	604	411	1164

TABLE 4-19

BASIC FUEL FLOW
FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/H?
PRESSURE: 8000 FT TEMPERATURE: 15 C

GROSS				FLIG	HT MOD	FLIGHT MODE (KTS)	_			
(182)	HIGE	HOGE	NOE	6.0	60	80	100	120	140	160
6+500	470	h Z S	194	604	387	389	415	464	559	701
7 • 000	164	095	492	425	90 <del>%</del>	00 %	425	477	515	121
7*500	226	663	129	244	414	ETH	438	\$ 60 \$	596	111
8 • 000	557	149	222	<b>49</b> 4	432	u 30	455	914	623	834
8+500	163	h89	283	06 %	452	8 11 13	475	535	657	922
000+6	627	132	62 <i>&amp;</i>	524	914	472	504	513	802	1062
9+500	<b>999</b>	190	083	570	503	<b>60</b> 5	543	621	196	1285

**TABLE 4-20** 

BASIC FUEL FLOW FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR PRESSURE: 8000 FT TEMPERATURE: 35 C

r		┰	_	_	7	_	~	-	•	-		-		_
		L	2	949	1	1678		17"	802		M # M		1168	16.03
		i i		529		4 4 4	223	0.00	965		0.40	123	761	3
		120		453		-	424		SCE	577	700	233	3	612
	<b>.</b>	100		412	17.5 17	* 7 *	0.30		458	405		523		583
24.77	HODE INIST	80		286	2017	100	421		439	199	33.	#6#		244
WT WOR	201	09	707	150	001	122	425		2 + 2	469		502	+	552
FI TONT		04	410	740	435		456		1 8 h	515		562		624
		NOE	979	2	505		538	100	366	611		663		138/
		HOGE	625		575		616	033	0 0	707		165	000	878
		HIGE	483		511		240	572		209	2.7.7	040	100	+00
GROSS	I E IGHTS	11851	6+500		2004		nnear	8,000		8 500	000.0	200	0.500	200

TABLE 4-21

BASIC FUEL FLOW
FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/H?
PRESSURE: 10000 FT TEMPERATURE: -25 C

	160	861	896	943	1004	1663	1184	1323
	140	1:29	9 19 9	675	217	151	302	867
	120	n 2 h	684	510	538	564	597	635
	100	104	417	624	9445	465	06 h	523
E (KTS)	08	371	380	168	403	425	647	473
HT MODE	09	361	372	386	402	421	ប្រក្	92.5
FLIGHT	0,4	379	394	411	4 30	454	482	517
	NOE	435	460	488	218	554	589	633
	HOGE	490	527	566	909	649	169	748
	HIGE	435	463	26 h	<b>524</b>	558	592	628
GROSS	(LBS)	6+500	7.000	7.500	8 • 500	8+500	9,030	9+500

TABLE 4-22

BASIC FUEL FLOW
FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LBS/HR
PRESSURE: 10000 FT TEMPERATURE: -5 C

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68055 (LBS) 6,500	HIGE 448	=	NOE 945	401	HT MCD 60 364 377	<u> </u>		12C 451 467	140 560 581	150
7.500 8.000	50 7 54 0	584	502 534	420	393	393	422	486 503	606	828
8 • 500	575	670	571	472	433	4 32	h9h	538	682	166
00046	611	123	616	509	459	458	496	577	141	1111
9.500	649	784	67 E	553	495	h6 h	240	636	851	1389

TABLE 4-23

BASIC FUEL FLOW
FUEL FLOW RATES FOR THE CIVEN CONDITIONS IN LBS/HR
PRESSURE: 10000 FT TEMPERATURE: 15 C

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	160	675	720	1787	28.8	1050	1799	1593
	140	533	554	582	620	679	791	14.5
	120	442	460	4 BC	507	546	610	764
	100	394	407	424	447	476	525	595
E (KTS)	80	376	384	401	421	945	4 85	544
HT MODE	09	370	385	403	424	451	687	5 5
FLIGHT	0,4	394	412	434	462	664	551	618
	NOE	457	486	518	553	5 3.8	654	721
	HOGE	520	523	109	645	969	158	825
	HIGE	194	06%	525	556	593	630	670
GROSS	(TBS) ·	6+500	7 0000	7.500	8,000	8+500	9+000	9• 500

TABLE 4-24

BASIC FUEL FLOW FUEL FLOW RATES FOR THE GIVEN CONDITIONS IN LUSTHR PRESSURE: 10000 FT TEMPERATURE: 35 C

-		-		_	_	-	-		-	_	_
	160	629	F. K.D		163	925	3	1170		1457	
	140	505	526		559	516	2	121		905	
	120	433	450		413	505		570		664	_
	100	393	408		429	45.7		205		212	12.5
E (KTS)	980	376	391		4.10	434		472	1	150	613
HT MCDE	909	379	396		416	441	1	08.7	+ 3 6 2	# C C	163
FLIGHT	១៛	ħOħ	425		154	488		539	5136	900	FAR
	NOE	694	200	1:	C 57	5 78		200		1	780
	390H	534	575		670	699	200	971	795	;	872
	HIGE	474	504	323	956	572	010	770	650		469
GROSS 4E IGHTS	(587)	6 • 500	7•000	7.501	2	00048	8 • 500		000 • 6		9-500

DELTA FUEL FLOW FOR DRAG DATA
1'ABLES

TABLE 4-25

CORRECTION FUEL FLOY LBS/HR : OR EXTERNAL DRAG PRESSURE: SEA LEVEL TEMPERATURE: -25 C

AIRCRAFT - AH-16

				7	AIR SPEED IN KIS	DINX	15	
The same of the sa		0.	20	0.0	100	120	140	160
UZAG	5.0	1	S	22	42	46	80	139
SGUARE FEET	16.0	3	13	23	64	'6	165	8 92

Preceding Page BLONK - FILMS

TABLE 4~26

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL BRAS PRESSURE: SEA LEVEL TEMPERATURE: -5 C

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				7 4	ATA SPEED IN KIS	DINK	15	
		40	<b>6</b> 0	០ឆ	100	120	0 4 1	160
DRAG	5.0	1	7	11	12	Ωħ	7.4	122
SQUARE FEET	10.0	3	6	22	£ tı	28	148	246

TABLE 4-27

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAS PRESSURE: SEA LEVEL TEMPERATURE: 15 C

					AIR SPEED IN KTS	DIN	175	
		D &	09	09	100	120	140	160
DRAG	0*5	7	5	10	20	38	<b>†9</b>	104
SQUARE FEET 1	10.0	2	8	20	39	13	133	217

**TABLE 4-28** 

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG PRESSURE: SEA LEVEL TEMPERATUREZ DA C AIRCRAFT - AH-16

				A1	AIR SPEED IN KTS	D IN K	15	
		40	9	38	001	120	140	160
DRAE	5.0	7	đ	6	18	32	25	97
SOUARE FEET	10.0	2	~	18	37	59	111	193

TABLE 4-29

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG PRESSURE: 2000 FT TEMPERATURE: -25 C AIRCRAFT - AH-19

				Α1	AIR SPEED IN KTS	D IN K	15	
		Ot	09	380	100	120	3 40	1 60
DRAG	5.0	ι	5	11	22	£ħ	74	125
SQUARE FEET	10.0	2	6	22	9.1)	88	154	548

**TABLE 4-30** 

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG PRESSURE: 2000 FT TEMPERATURE: -5 C AIRCRAFT - AH-16

				AI	AIR SPEED IN KTS	DINK	15	
		O#	ນ9	03	100	120	061	1 60
DRAS	2.0	1	3	10	CZ	38	69	114
SAUARE FEET	10.0	2	æ	20	04	11	137	230

And the second s

TABLE 4-31

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAS PRESSURE: 2000 FT TEMPERATURE: 15 C AIRCRAFT - AH-10

				AIR	AIR SPEED IN KTS	IN KI	S	
		04	09 .	oa	001	120	140	160
DRAG	5.0	-	÷	6	18	33	0.8	16
SQUARE FEET 1	10.0	2	80	18	37	89	b21	203

TABLE 4-32

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAS PRESSURE: 2000 FT TEMPERATURE: 35 C AIRCRAFT - AH-IG

				¥	AIR SPEED IN KTS	NI Q	(TS	
		0.	פּכ	08	001	120	140	160
DAAG	5.0	1	3	8	17	30	53	9.0
SQUARE FEET	10.0	2	1	17	34	61	109	180

**TABLE 4-33** 

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAS TEMPERATURE: -25 C PRESSURE: 4000 FT

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				4.1	AIR SPEED IN KTS	DINK	75	
		40	09	09	100	120	140	160
DRAG	5.0	1	•	10	12	0.4	7.0	116
SQUARE FEET	10.0	3	<b>4</b> 1	20	43	83	145	232

**TABLE 4-34** 

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAS

PRESSURE: #000 FT TEMPERATURE: -5 C

				AI	AIR SPEED IN KTS	D IN K	15	
		940	09	EC	100	120	1 40	160
DRAG	5.0	1	ħ	9	61	32	49	101
SQUARE FEET 1	10.0	2	8	19	38	12	128	214

TABLE 4-35

CORRECTION FUEL FLOW LBS/HK FOR EXTERNAL DRAG PRESSURE: 4600 FT TEMPERATURE: 15 C AIRCRAFT - AH-16

				AI	AIR SPEED IN KIS	DINK	15	
		0 th	.60	08	001	120	140	160
DRAG	5.0	1	7	6	11	31	57	91
SQUARE FEET	10.0	2	1	1.7	3.6	119	116	190

TABLE 4-36

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG PRESSURE: 4000 FT TEMPERATURE: 35 C AIRCRAFT - AH-16

					-			
				AI	AIR SPEED IN KTS	NI C	15	
		04	09	28	100	120	140	160
ORAG IN	2•0	1	3	æ	16	28	2:0	83
SQUARE FEET	10.0	2	9	16	32	25	102	16.7

**TABLE 4-37** 

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG Pressure: 6000 ft temperature: -25 c Aircraft - AH-16

S	53	707	66 103	135 212
AIR SPEED IN KTS	120		38	7.8
R SPEE	100		20	Ð#
I	03		6	19
	60			8
	90	•	-	2
		C 4		10.0
		DRAG	IN	SULARE FEET

TABLE 4-38

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAS PRESSURE: 6000 FT TEMPERATURE: -5 C

				A	AIR SPEED	D IN KTS	(TS	
		Q#	. 60	03	100	120	1 4C	1 60
DRAG	5.0	1	27	6	17	3.3	100	
NI CONTRACTOR								ח
SUCARE FEEL	10.0	2	~	17	35	67	6 .	100
						)	7	7 7 4

TARIF 4-30

CORRECTION FUEL FLOW LOS/HR FOR EXTERNAL DRAG PRESSURE: GUOD FT TEMPERATURE: 15 C Alreraf? - AH-10

-			
	160	38	17.6
XTS	243	53	109
13	120	29	29
K SPEED 1	130	16.	32
AI	82	8	91
	20	3	~
	3	-	N.
		<b>-</b>	
1			10.1
	289		ANE LECT
·		Cattan	2007
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TABLE 4-40

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG PRESSURE: 600C FT TEMPERATURE: 35 C AIRCRAFT - AH-16

				A	AIR SPEED	D IN KTS	TS		
		40	90	03	100	120	140	1.60	
DRAG	5.0	•	*	ľ					
NI		•	2		15	28	4.7	7.7	
SOUARE FEET	10.0	2	9	15	29	53	96		
					1	,	י י	961	

TABLE 4-41

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG PRESSURE: 8000 FT TEMPERATURE: -25 C AIRCRAFT - AH-16

				A	AIR SPEED IN KTS	DINX	TS	
		0.40	9	60	100	120	1 40	160
DRAG	5•0	1	7	S	18	36	62	100
SOUARE FEET	10.0	2	2	18	3.7	7.3	129	199

TABLE 4-42

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG PRESSURE: 800G FT TEMPERATURE: -5 C AIRCRAFT - AH-1G

	,			AI	AIR SPEED 1	IN KTS	1.5	
		04	29	9.0	100	120	0 1	160
DRAG	5.0	1	2	8	16	31	55	36
SQUARE FEET	10.0	2	7	16	33	63	110	184

TARIF 4-43

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG PRESSURE: 800° FT TEMPERATURE: 15 C

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	<del>-</del>			AI	AIR SPEED IN KTS	D IN K	7.5	
		40	20	90	100	021	140	160
DRAG	5.0	1	3	1	51	27	20	8.1
SQUARE FEET	10.0	2	9	15	30	99	102	167

TABLE 4-44

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG PRESSURE: 800C FT TEMPERATURE: 35 C

				4	AIR SPEED IN KIS	NI G	115	
		Q to	29	03	100	120	140	160
DRAG	5.0	1	3	1	77	25	33	F
SOUARE FEET	10.0	2	9	12	27	20	PS PS	146

TABLE 4-45

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG PRESSURE: 10000 FT TEMPERATURE: -25 C AIRCRAFT - AH-16

				Α 3	AIR SPEED IN KTS	D IN K	15	
		40	09	90	100	120	140	160
DRAG	S.0	1	٤ .	8	11	33	80	26
SQUARE FEET	10.0	2	7	17	35	58	121	184

TABLE 4-46

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG PRESSURE: 10000 FT TEMPERATURE: - F C

AIRCRAFT - AH-16

				A	AIR SPEED IN	NI O	XTS	
		40	60	38	100	120	140	160
CRAG	5.0	1	3	1	15	29	51	98
SQUARÊ FEET	10.0	2	9	15	31	59	103	171

TABLE 4-47

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAG PRESSURE: 10000 FT TEMPERATURE: 15 C AIRCRAFT - AH-16

				A 1	AIR SPEED IN KTS	D IN K	rs	
		04	29	38	100	120	342	160
DRAG	0*5	1	£	7	14	25	1.1	11
SOUARE FEET	10.0	2	9	3.4	28	25	95	151

**TABLE 4-48** 

CORRECTION FUEL FLOW LBS/HR FOR EXTERNAL DRAS TEMPERATURE: 35 C PRESSURE: 10000 FT

				AI	AIR SPEED IN KIS	NI Q	15	
		4.0	09	03	100	120	140	1 60
DRAG	5.0	1	3	9	13	23	14	99
SOUARÊ FEET	10.0	2	2	13	56	8 \$	85	138

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GROUND ICLE FUEL FLOW DATA

TABLE

TABLE 4-49

GROUND IDLE FUEL FLOW AIRCRAFT - AH-12

		PRESS	PRESSURE ALTITHOE (F))	110E (F)			
		SEA LEVEL	2000	4000	9009	0 u 0 8	0000
	-25 C	389	37.1	253	336	318	300
I E H F E A F ON C	<b>-5 €</b>	341	37.5	358	337	319	108
	15 C	168	374	356	336	321	303
Len Londe	35 C	246	376	856	1+0	374	307

INTRIES ARE AIRCRAFT FUEL FLOW RAILS IN LUS/HR

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GROSS WEIGHT LIMITS DATA **TABLES** 

**TABLE 4-50** 

GROSS WEIGHT LIMITS

(DUE TO ENGINE)

FOR TAKEOFF CRITERIA #1

ICUR OF HAXIMUM POWER ITHOGE)

AIRCRAFT - AH-1G

			P	RESSURE A	PRESSURE ALTITUDE (FT)	13	
		SEA LEVEL	זנננ	000	2009	9000	10000
TEMPEDA TIIDE	-25 C	13881	12582	11704	10856	1 006 3	9322
DEGREES	-5 C	92121	11275	10440	9699	8958	8561
CERTICOADE	15 C	10214	9762	8106	8338	1708	7038
	35 C	8766	8143	7530	2 16.9	6394	836S

ENTRIES ARE AIRCRAFT GROSS WEIGHTS IN LBS

STRUCTURAL GROSS WEIGHT LIMIT: 9,500 185

TABLE 4-51

GROSS WEIGHT LIMITS
(DUE TO TRAMSMISSION)
FOR TAKEOFF CRITERIA #1
100% OF MAXIMUM POWER (MOGE)
AIRCRAFT - AH-16

			Р	PRESSURL A	ALTITUDE (FT)	FT)	
		SEA LEVEL	2000	0004	0009	0008	10000
TOWOLDATEDO	-25 C	0206	2636	D+;+ 6	9251	1306	8988
DE COFFE	-5 C	8136	1546	35.25	8308	9865	0998
) <b>-</b>	15 C	9433	3526	9906	8877	96 36	8449
	35 C	9264	8006	1888	8755	8481	8229

ENTRIES ARE AIRCRAFT GROSS WEIGHTS IN LES

STRUCTURAL GROSS WEIGHT LIMIT: 9,500 LBS

TABLE 4-52

GROSS WEIGHT LIMITS
(DUE TO ENGINE)

FOR TAKEOFF CRITERIA #2

OGE

95% DF RATED POWER. VERTICAL RATE OF CLIMB 45C FT/MIN. AIRCRAFT - AH-16

			R d	ESSURE AL	PRESSURE ALTITUDE (FT)	7.3	
		SEA LEVEL	2002	0004	2009	0308	1000
	2 52-	1244	1584	11101	9666	9926	9884
· TEKPERATURE	2 S-	11111	10358	9589	0.088	8227	7817
GEGREES	15 C	2632	8943	1928	7637	1059	6444
CENITGRADE	35 C	1708	2447	0889	1429	5839	5335

ENTRIES ARE ALACRAFT GROSS WEIGHTS IN LBS

STRUCTURAL GROSS WEIGHT LIMIT: 9.500 :85

**TABLE 4-5**2

OGE TRANSMISSION POWER LIMIT. VERTICAL RATE OF CLIMB 450 FT/MIN. FOR TAKEOFF CRITERIA #2 IDUE TO TRANSMISSION) GROSS WEIGHT LIMITS AIRCRAFT - AF-16

			PA	RESSURE AL	PRESSURE ALTITUDE (FT)	1	
		SEA LEVEL	2000	000\$	2009	0000	1 000
TEMBERATION	-25 C	9289	9134	9968	817.55	8625	8453
DEGREES	-5 C	2216	8957	6789	8622	R & S &	8278
CENTIGRACE	15 C	8959	8793	8629	8463	8251	8 105
	35 C	9088	# t> 9	8480	8311	8121	7975

ENTRIES ARE AIRCRAFT GROSS WEIGHTS IN LUS

STRUCTURAL GROSS WEIGHT LIMIT: 9.500 LBS

**TABLE 4-54** 

GROSS WEIGHT LIMITS
(DUE TO ENGINE)
FOR TAKEOFF CRITERIA #3
1COR OF MAXIMUM POWER INIGE)
AIRCRAFT ~ AH-10

			00	100000			
	- <b>-</b>		K.	ESSURE AL	FACSSORE ALTITUDE (FT)	=	
		SEA LEVEL	2002	1000	2000	9356	3000
						פחרם	3000T
	3 67-	15549	14470	13461	12486	1 1577	1
I LEMPERA JURE							17171
	-5 C	13937	12957	1 1 90 7	11116	. 000	
DEGREES					0.777	16201	0 to 8 fs
	15 5	1,2083	11219	INTER	2 020	0.000	
CENTIGRADE	1				2303	8628	8030
	35 C	92001	9360	8655	0404	376. 3	
							X

ENTRIES ARE AIRCRAFT GROSS WEIGHTS IN LBS

STRUCTURAL GROSS WEIGHT LIMING 9.500 18S

TABLE 4-55

GROSS WEIGHT LIMITS

(DUE TO TRAMSMISSIOM)

FOR TAKEOFF CRITERIA #3

100% OF MAXIMUM POWER (HIGE)

AIRCRAFT - AH-16

			d	PRESSURE ALTITUDE (FT)	LTITUDE (	FT3	
		SEA LEVEL	2000	0004	0009	8000	1 0000
	-25 C	11266	11060	10851	10:6 3 E	10415	36101
TEMPERATURE	-5 C	14041	10840	10628	10411	10 I e 8	1566
DEGREES	15 C	248DE	10634	10450	זמגכנ	9973	9730
CENILGRADE	32 C	10650	35501	10223	33001	9762	<b>\$056</b>

ENTRIES ARE AIRCRAFT GROSS WEIGHTS IN LBS

## STRUCTURAL GROSS WEIGHT LIMIT: 9:500 LBS

## VELOCITY LIMITS DATA TABLES

**TABLE 4-56** 

TEMPERATURE: (INCLUDING FUEL FLOW RATES) VELOCITY LIMITS TABLE PRESSURE: SEA LEVEL

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	$\overline{}$			•	<del></del>	+	_	_	-	_
CITY NEVER		F.F.		1217	1245	:274	1301	1328	1356	1388
VELOCITY	ì	VEL		191	167	167	191	167	167	191
TRANSMISSION LIMITS		F.F.		739	139	139	139	739	739	739
TRANS		VEL	•	134	133	132	130	129	121	125
MAX OWER	INE	F.F.		1021	1057	1021	1601	1901	1057	-1057
MAX POWER	(ENG)	VEL (KTS)	`	158	156	155	154	152	151	140
MAX INUOUS	JER	F.F.		1045	5401	1045	1045	1045	1045	1045
MAX CONTINUOUS	PO	VEL (KTS)		151	156	154	153	152	150	641
LONG		F.F. (LBS/HR)		999	673	089			101	710
R C		(KTS)		124	124	124	124	123	123	122
			CEOSS WEIGHTS (LBS)	6• 500	7 • 000	7•500	8•១០០	8• 500	000+6	9• 500

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TABLE 4-57

VELOCITY LIMITS TABLE (INCLUDING FUEL FLOW RATES)

PRESSURE: SEA LEVEL TEMPERATURE: -5 C

- 1		7		-	_	_			_	
	VELOCITY NEVER EXCEED	FoFe	IL BSZHK)	25.7.	1136	1130	1107	1916	9777	19.78
	WELDC	VEL	4	1.24			76.		-	2.70
	TRANSPISSION LIMITS	F . F .	, L. 1937	74.7	101	7.8.7	197	74.7	74.7	74.7
	TRANS	VEL		141	1 40	139	13	138	1.34	133
	HAX OWER Gine)	F.F.		953		953	953	95.3	953	953
	HAX POWER			160	159	157	156	155	153	152
	MAX Inuous Ower	F.F.		\$03	903	503	903	903	903	903
	CONTINUOUS POWER	VEL (KTS)		156	155	154	. 152	151	149	148
	LONG	(LBS/#R)		899	ħ19	674	919	519	685	695
	R	VEL (KTS)		131	130	129	128	127	126	125
	<del></del>		GROSS WEIGHTS (LBS)	6,500	1.000	7 • 500	8 • 000	8 • 500	9• 000	9+500

**TABLE 4-58** 

VEROCITY LIMITS TABLE (INCLUDING FUEL FLOW RATES)
PRESSURE: SEA LEVEL TEMPERATURE: 15 C

				_	_	_	_			
ITY NEVER	EXCEED	F.F.		1105	1116	1124	1133	1150	1179	1233
VELOCITY	LI.	VEL		7.80	1 80	280	180	160	180	180
TRANSMISSION	LIFITS	F.F. (LBS/HR)		755	755	755	755	755	755	755
TRANS	<b>17</b>	VEL (KTS)		146	245	164	143	141	139	137
MAX	INE)	(FeF.		148	841	841	841	149	841	841
2 6	(ENGINE)	VEL (KTS)		155	151	153	152	121	149	147
MAX	VER	(L85/HR)		181	181	787	187	787	7.67	787
H.	POWER	VEL (K TS)		150	149	148	146	145	143	141
LONG		(LBS/HR)		867	673	619	683	689	100	714
1.0		VEL		134	134	134	133	221	132	132
			GROSS WEIGHTS (LBS)	6 • 50C	7,000	7 • 500	8 • 000	8 • 50C	9 • 000	8•500

TABLE 4-59

VELOCITY LIMITS TABLE.

(INCLUDING FUEL FLOW RATES)

PRESSURE: SEA LEVEL TEMPERATURE: 35 C

	VELCCITY NEVER	catte	ניני	(LBS/HR)				1094	7 4 7	5.73	1047	1067	1601	1084	1135	T
	VELCCI	Y Z	AE:	CK TS J				186	186		186	185		186	186	+
	TRANSMISSION LIMITS		9 E	(KTS ) (LBS/HR)				763	163		763	763		763	763	
	TRANSP		VEL	(KTS)			,	25.5	152			150			146	
	E P	ME 2		(LBS/HR)			301	233	728	126	327	126	326	921	126	126
	FAX POWER	$\perp$	VEL	(5145					148	145		145	201			1 30
	MAX Inuous Oufr		C ACTUB	2 45 75 75			6.81		788	681		790	681	.00	700	581
	CONTINUOUS	1	(KTS)				7#1	1 4 1		139	97.1		136	12	1	131
	RANGE	FEE	(LBS/HR)				013	678		200	692		1 502	721	120	133
]			(X TS)		· ·	13.5		140	2	740	140	1000	DAY.	1 40	140	
				GROSS	(1883)	6+500		7• 000	7.500		8 • 000	8.500		9•000	005+6	

TABLE 4-60

VELOCITY LIMITS TABLE (INCLUDING FUEL FLOW RATES)

PRESSURE: 2000 FT TEMPERATURE: -25 C

EVER		Ž.					ء ا	,  -	Τ,
ITY NE XCEED	L		125	120	121	10.4		141	
VEL OC	VEL		173	27.10	27.1	2 12	173	.173	
MISSION MITS	F.F.		725	125	725	725	725	725	725
LEANSI	1		137	136	134	133	131	129	121
AX Wer Ine)		_	984	984	196	₩86	984	984	984
M POI (ENG)	VEL (XTS)		156	155	154	152	151	149	14.7
KX VUOUS VER	F.F.		996	386	996	996	996	986	996
CONTI	VEL (KTS)		155	154	153	151	150	148	146
ang Ange	F.F. (LBS/HR)		625	633	639	949	654	663	699
. &	VEL (KTS)		124	124	123	123	122	122	121
		GRY SS WEIGHTS (LBS)	6• 500	7+000	7.500	8•000	8,500	3 • 000	9• 500
	RANGE CONTINUOUS POWER LIMITS EXCEED	CONTINUOUS POWER LIMITS F. VEL F.F. VEL F.F. VEL F.F. S/HR) (KTS) (LBS/HR) (KTS) (LBS/HR)	RANGE CONTINUOUS POWER LIMITS  VEL F.F. VEL F.F. VEL F.F. VEL F.F.  (KTS) (LBS/HR) (KTS) (LBS/HR) (KTS) (LBS/HR)	LUNG	LUNG	TRANSMISSION   TRANSMISSION   TRANSMISSION   TRANSMISSION   TENGINE   LIMITS   LIMITS   LIMITS   LIMITS   LIMITS   LIMITS   LESS/HR   LESS/HR	Fanse   Fans	VEL   F.F.   VEL   VEL   F.F.   VEL   F.F.	VEL   F.F.   VEL   VEL   F.F.   VEL   F.F.   VEL   F.F.   VEL   F.F.   VEL   F.F.

VELOCITY LIMITS TABLE (INCLUDING FUEL FLOW RATES)
PRESSURE: 2000 FT TEMPERATURE: -5 C

VELOCITY NEVER EXCEED		(LBS/HR)		1155	1180	1199	1219	1247	1200	1289
VELO	•	(X TS)		1 80	180	1 80	180	A RO		707
TRANSPISSION LIMITS	F.F.	(LBS/HR)		132	732	732	732	732	132	3,
TRANS	VEL		2.47	\$ 5.7	143	142	140	138	136	
MAX OWER GINE	Fere		388	200	886	886	386	8.8 E	886	
MAX POWER	VEL		159		12/	156	155	153	191	
 KAX Inuous Ower	F.F.		641	0 0 0 0	740	841	841	841	841	1 8 41 1
RAX CONTINUOUS POWER	VEL (KTS)		155	154		152	151	149	141	145
L GNG Range	F.F.		627	627		879	632	633	650	£65
2 %	VEL (KTS)		130	129	120	0 74	177	126	125	125
		GROSS WEIGHTS (LBS)	6+500	7 • 000	7.500	8 .000	00010	00048	9•00	9+500

TABLE 4-62

(INCLUDING FUEL FLOW RATES)
R: 2000 FT TEMPERATURE: NS C VELCCITY LIMITS TABLE

PRESSURE: 2000 FT

Į	ER	£.						T	-	Γ
	VELOCITY NEVER Exceed	F.F. (LBS/HR)		1109	1115	1125	1143	1180	1252	1353
	E) AEFOC]	VEL		181	187	187	187	187	187	187
	TRANSMISSION LIMITS	F.F. (LBSZHR)		622	739	139	739	739	739	739
	TRANSH LIM	VEL (KIS)		150	148	141	145	143	141	138
	X IER INE 1	F.F.		181	181	781	181	781	181	781
	MAX POWER (ENGINE)	VEL (KTS)		124	153	152	150	148	941	£ # T
	IVOUS ER	(AH\ZBZ)		181	131	131	131	731	131	731
	MAX CSMIINUOUS POWER	VEL (K TS)		641	148	941	bbI	242	140	137
	LONG Range	F.F. (LBS/HR)		979	289	519	249	<b>654</b>	670	069
	RA	VEL (KTS)		134	139	133	132	132	132	132
	Resources -egmod		6405S Weishts (185)	205 • 3	7,039	003 • 1	G0C+8	8 • 500	090•6	9,500

TARI F 4-63

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 2000 FT TEMPERATURE: 35 C

	. R	LONG Range	MAX CONTINUOUS POWER	MAX Inuous Ower	MAX Poyer (engine)	MAX Oyer Gine 1	TRANS	TRANSPISSION LIHITS	VELOCITY Exce	CITY NEVER Exceed
	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F. (LBS/HR)	VEL (KIS)	F.F. (LBS/HR)	VEL KKS)	F.F.	VEL	F.F.
GROSS WEIGH) S										
6+500	140	0£9	140	630	147	675	157	746	477	901
7 • 000	140	636	139	630	146	675	156	746	177	306
7+500	140	h h 9	137	630	145	675	155	342	111	916
8•000	3 h C	659	135	630	143	675	153	342	177	941
8 • 500	140	613	132	630	140	6.55	151	746	477	987
000 •6	0 % 1	693	129	630	137	675	148	246	177	1059
9 • 500	139	705	125	630	134	6.75	19 4	746	117	1158

TABI F 4-64

VELOCITY LIMITS TABLE INCLUDING FUEL FLOW RATES!

TEMPERATURE: -25 C

PRESSURE: 4000 FT

	CITY NEVER Exceed	F.F. (LBS/HR)		1297	1329	1359	1390	1430	1485	1559
	VELOCITY Exce	VEL (KTS)		180	180	180	180	180	180	180
	TRANSMISSION LIMITS	F.F. (LBS/HR)		713	713	713	713	713	713	713
	TRANSP	VEL (KTS)		139	138	136	134	148	130	128
	MAX Ower Gine)	F.F. (1.85/33)		916	916	916	916	916	916	916
	MAX POWER (ENGINE)	V( L		155	154	152	150	146	147	144
	MAX Inuous Ower	F.F. (LBS/HR)		892	892	892	892	892	892	892
	MAX CONTINUOUS POWER	VEL (KTS)		154	152	151	6 1 1	241	345	143
	LONG RANGE	F.F. (LBS/HR)		588	£ 8 th	109	019	618	625	129
	L'	VEL (KTS)		124	123	123	122	122	120	116
•			GFOSS WEIGHTS (LBS)	005 +9	7 • 000	1• 500	8 • 000	8 500	00046	005 •6

TABLE 4-65

VELOCITY LIMITS TABLE
(INCLUDING FUEL FLOW RATES)
PRESSURE: 4000 FT TEMPERATURE: -5 C

WELOCITY NEVER Exceed	F.F.		1177	1198	1218	1250	1302	1380	1487
VELOCI EX	VEL (K TS)		187	187	181	187	181	187	487
TRANSFISSION LIMITS	F.F.		119	719	119	119	719	719	-719
TRANSFISS LIMITS	VEL (KTS)		147	146	144	142	140	138	135
IX IER INE )	F.F. (LBS/HR)		82C	820	82C	820	820	820	820
MAX POWER (ENGINE)	VEL (KTS)		151	136	154	751	051	148	341
X UOUS ER	F.F.	ï	182	782	182	182	182	182	182
RAX CONTINUOUS POWER	VEL (KTS)		154	152	121	149	147	144	142
LONG Range	F.F. (LBS/HR)		582	584	588	596	808	624	645
LO	VEL (K TS)		129	128	127	126	125	125	125
		BROSS WEIGHTS (LBS)	6 • 500	7 000	7,500	8,000	8 + 500	000 • 6	9,500

TABLE 4-66

VELOCITY LIMITS TABLE (INCLUDING FUEL FLOW RATES)

PRESSURE: 40CG FT TEMPERATURE: 115 C

				_	_	_			
CITY NEVER Exceed	F.F.		933	943	963	999	1063	1152	1267
VELOCITY Exce	VEL		176	176	176	176	176	176	176
TRANSMISSION LIMITS	F.F.		725	725	125	725	725	725	725
TRANSM	VEL (KTS)		153	152	150	8 4 1	145	241	139
MAX Ower Gine)	(F.F.		121	121	721	121	121	121	121
MAX POWER (ENGINE)	VEL (KTS)		153	121	149	141	5 1 1	142	138
 MAX Tinuous Poher	F.F.		119	611	119	113	119	613	611
MAX CONTINUOUS POWER	VEL (KTS)		147	346	144	242	139	136	132
LONG Range	F.F. (185/HR)		587	290	593	611	627	9#9	699
RA	VEL (KTS)		134	133	132	132	132	131	131
		GFOSS WEIGHTS (LBS)	6 • 500	7,000	7 • 500	8 • 000	8•500	9 • 000	9+500

VELCCITY LIMITS TABLE
(INCLUDING FUEL FLOW RATES)
PRESSURE: 4000 FT TEMPERATURE: 35 C

œ	1	^	T			T	T	7	_	Т	T	
VELOCITY NEVER Exceed		(LBS/HR)		1736	0.72		768	108	843	9.0	21.5	1627
VELOC	VEL	(KTS)		-163	163		697.	163	163	152		163
TRANS PISSION LIMITS	FoFe	(LBS/HR)		151	731	121	101	(31	731	731	12.5	1.21
TRANS	VEL			791	160	15.8		133	151	147	1	
MAX OWER GINE	FeFe	LESZ RK)	628	25.7	624	624	524		, 7 q	624	624	
MAX POWER (ENGINE)	VEL		3 46		*	142	139		927	132	121	
MAX Inuous Ower	F.F.		582		285	582	582	582	300	585	582	
MAX CONTINUOUS POWER	VEL (KTS)		138	1	4.36	134	131	127		1221	114	
LUNG RANGE	F.F.		591	003	333	614	631	548	. 30	/CB	671	
. B	VEL (KTS)		140	1 47		140	140	140	127		134	
		GROSS WEIGHTS (LBS)	6 • 500	7 0000		7.500	8 • 000	8 • 500	9.000		9.500	
	i	106		<u> </u>	1	1			ı.		1	

VELOCITY LIMITS TABLE (INCLUDING FUEL FLOW RATES)

PRESSURE: 6000 FT TEMPERATURE: -25 C

E5	1602
IISSI IITS ILBS	an v
19 19 19 19 19 19 19 19 19 19 19 19 19 1	
MAX OVER GINE) (LSS/H3) (LSS/H3) 8 849 8 849 8 849	
MAX POWER (ENGINE) VEL F (KTS) (LE 152 152 150 146 146	
MAX CONTINUOUS POWER (KTS) (LBS/HR) 152 825 156 825 146 825 146 825 146 825	920
MAX CONTINUOUS POWER VEL F. (KTS) (LBS, 152 E 156 E 146 E	- 30
LONG RANGE 3 (LBS/HR) 3 551 3 558 2 567 9 579 6 579	593
L VEL (KYS) 123 123 122 121 121 116	114
EROSS WEIGHTS (LBS) 6.500 7.000 7.500 8.500	005 • 6
, , , , , , , ,	

VELOCITY LIMITS TABLE
JINCLUDING FUEL FLOW RATES)
PRESSURE: 6000 FT TEMPERATURE: -5 C

	2		ſ				7	_	٦		+	_	_	-	_	_	_	_
	VELOCITY NEVER	EXCLED		(LBS/HR)				983		1003		1034	163.7		1151		1245	
	VELOC		133	(K 15)				175		175		113	175		175		175	136
	TRANSFISSION		-3-3	(LBS/HR)				707		707	707		707		707	2	191	101
	TRANS		VEL	(KTS)				150		2	146	1	144		7.47	1 3.8		135
	HAX OVER	INE	F . F.	(LBS/HR)			36.0	797	35.2	30:	762		79/	162	201	762	155	701
	POVER	LENG	KE	(KTS)			155	9	154		7257	0.00	7	147		441	2	-
	MAX INUOUS OUFB		74 e 74 e 94 e 94 e 94 e 94 e 94 e 94 e	(LDS/HK)			125		725	325	67,	125		725		67/	125	
	CONTINUOUS	7	INTEL				152		DC T	1 4 8		146		C & T	071		137	1
280	RANGE	5.5	(LBS/HR)			3	240	566	270	554		267	200	3	609		632	1
•	62	VE	(KTS)			120	0 34	126		126		125	125		125		1221	
				GROSS	(LBS)_	6,500		1 000 1		7 500	000.8	00046	8 500		9, 000	202.0	2000	

VELOCITY LIMITS TABLE (INCLUDING FUEL FLOW RATES)

PRESSURE: 6000 FT TEMPERATURE: 15 C

			_			_		
F.F.		147	163	190	833	568	978	1638
VEL (KTS)		161	191	161	191	191	161	191
F.F. (LBS/HR)		713	713	713	713	713	713	713
VEL (KIS)		151	991	152	6 6 7	341	241	137
F.F.		1.95	199	199	199	199	199	199
VEL (KTS)		121	641	147	344	140	136	131
F.F. (LBS/HR)		628	628	628	628	829	628	628
VEL (KTS)		146	144	141	138	135	131	125
F.F. (LBS/AR:		248	556	569	587	909	631	629
VEL (KTS)		133	132	132	132	131	131	130
	GROSS WEIGHTS (LBS)	6 • 500	2.000	7.500	8,000	8 • 500	00046	9,500
	(LBS/AR; (KTS) (LBS/HR) (KTS) (LBS/HR) (KTS)	(KTS) (LBS/AR: (KTS) (LBS/HR) (KTS) (LBS/HR) (KTS)	VEL         F.F.         VEL         F.F.         VEL         F.F.         VEL           (KTS)         (LBS/HR)         (KTS)         (LBS/HR)         (KTS)         (LBS/HR)         (KTS)           3         133         548         146         628         151         567         157         713         161	VEL         F.F.         VEL         F.F.         VEL         F.F.         VEL         F.F.         VEL         VEL	VEL         F.F.         VEL         F.F.         VEL         F.F.         VEL         F.F.         VEL         VEL	VEL         F.F. (KTS)         VEL         F.F. (KTS)         VEL         F.F. (KTS)         VEL         F.F. (KTS)         VEL         F.F. (KTS)         VEL         VELS         VELS	VEL (KTS)         F.F. (LBS/HR)         VEL (LBS/HR)         F.F. (KTS)         VEL (LBS/HR)         F.F. (KTS)         VEL (LBS/HR)         VEL (KTS)         VEL (KTS)<	VEL         F _o F _o VEL         VEL

TABLE 4-71

VELOCITY LIMITS TABLE (INCLUDING FUEL FLOW RATES)

PRESSURE: 6000 FT TEMPERATURE: 35 C

	<u>يَ</u> دَ	LONG RANGE	MAX CONTINUOUS POWER	MAX TINUOUS Power	MAX Power (Engine)	AX JER (NE)	TRANSF	THANS FISSION LIMIT'S	VELOC	VELOCITY NEVER EXCEED
	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F.	VEL (KTS)	F.F. (LBS/HR)	VEL (KTS)	F.F.	VEL (K 1S)	F.F.
GROSS WEIGHTS (LBS)										
6 • 500	140	925	9£1	539	143	5.7.6	166	718	146	593
7 • 000	140	115	133	533	141	576	183	718	145	909
7,500	140	288	130	623	9£1	576	159	718	196	623
8 • 000	140	909	1 26	533	<b>5£1</b>	57.5	155	716	146	8#9
8 • 500	136	219	120	623	130	576	051	718	146	664
9• 000	134	833	111	539	123	515	145	718	146	740
9+500	131	613	h6	625	111	516	137	718	146	831

TABLE 4-72

WELOCITY LIMITS TABLE (INCLUDING FUEL FLOW RATES)

PRESSURE: 8000 FT TEMPERATURE: -25 C

				_	<del></del>				
CITY NEVER Exceed	F.F.		1117	1149	1192	1252	1335	1445	1582
VELOGITY Excee	VEL		176	176	176	176	176	176	176
TRANSMISSION LIMITS	F.F.		269	690	690	069	069	069	069
TRANSM	VEL (KTS)		144	242	140	137	134	131	121
X IER INE 1	F.F.		181	181	787	181	187	787	787
MAX POWER	VEL (KTS)		152	150	148	342	241	139	136
IV TUOUS TER	F.F. (LBS/HR)		160	160	180	160	160	160	760
MAX CONTINUOUS POWER	VEL (K TS)		150	148	145	143	140	137	134
LONG RANGE	F.F. (LBS/HR)		217	125	533	535	240	523	290
LC RA	VEL (KTS)		123	122	121	118	115	114	114
		GROSS WEIGHTS (LBS)	6 500	1.000	7 500	00048	8•500	000•6	9+500

TABLE 4-73

VELOCITY LIMITS TABLE

XINCLUDING FUEL FLOW RATES)
PRESSURE: 8000 FT TEMPERATURE: -5 C

1	1			7	_	1	7	7	7
VELOCITY NEVER Exceed	F.F.		1769	794	833	801	949	1038	
VELOCI	VEL		160	160	160	160	160	160	3.
ISSION TS	F.F.		695	695	695	695	695	695	202
TRANS MISSION LIMITS	VEL (KTS)		153	151	148	145	142	138	12.
NER NER	F.F. (LBS/HR)		703	703	70.3	703	703	703	20%
MAX Power (Engine)	VEL (KTS)		154	152	149	146	142	139	77.
X Ugus ER	F.F.		699	689	699	699	699	699	669
MAX CONTINUOUS POWER	VEL (KTS)		150	148	145	142	139	135	130
LONG RANGE	(LBS/HR)		506	515	528	547	115	597	630
LO RA	VEL (KTS)		126	126	125	125	125	124	124
		GROSS WEIGHTS (LBS)	6+500	7 • 000	7+500	8•000	8+500	00046	9+500

TABLE 4-74

WELDCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

TEMPERATURE: 45 C PRESSURE: 8000 FT TEMPERA AIRCRAFT - AH-16

						_	_		-
CITY NEVER Exceed	F.F. (LBS/HR)		588	603	627	959	169	160	198
VELOCITY EXCE	VEL (KTS)		144	144	114	电电飞	4 4 1	144	561
TRANSMISSION LIMITS	F.F. (LBS/HR)		700	00 <b>1</b>	001	201	001	200	201
TRANSP	VEL (KTS)		160	157	153	149	145	139	131
MA X OWER Gine 1	F.F. (LBS/HR)		919	319	919	9 k9	919	919	919
MAX POWER (ENGINE)	VEL (KTS)		149	146	143	139	134	128	118
IV IUOUS IER	F.F.		581	581	581	185	581	581	185
MAX CONTINUOUS POWER	VEL (KTS)		143	141	138	134	129	122	111
LONG RANGE	F.F. (LBS/HR)		516	529	245	267	593	613	658
8	VEL (KTS)		132	132	132	131	131	128	125
		CFOSS WEIGHTS (LBS)	6 500	7.000	7.500	8 • 000	8 50€	000 • 6	9 500

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**TABLE 4-75** 

VELOCITY LIMITS TABLE (INCLUDING FUEL FLOW RATES)
PRESSURE: 8000 FT TEMPERATURE: 35 C

1			_	_	_		_	-	_	
	VELOCITY NEVER EXCEED	FoF	ונפטעאא	107	201	515	520	575	54.3	74.6
	AETOC	VEL	( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )	120	120	129	129	129	129	120
	TRANSMISSION LIMITS	F.F.		.705	705	705	705	705	705	705
	TRANS	VEL		169	163	158	152	146	137	125
	MAX OWER GINE)	F.F.		531	531	531	531	531	531	531
	M AX POWER (ENGINE)	VEL (KTS)		140	137	133	128	118	104	0
	MAX Inudus Oner	F.F. (LBS/HR)		105	501	50.1	501	56.1	591	531 125 705 120
	MAX CONTINUOUS POWER	VEL (XTS)		134	130	125	118	109	16	0
	LONG Range	(LBS/HR)		529	245	562	570	593	631	969
	<u>.</u> 8.	VEL (KTS)		140	140	139	135	133	121	123
			GROSS WEIGHTS (LBS)	6,500	7 • 000	7,500	8 • 000	8 - 500	9 000	005*6

**TABLE 4-76** 

VELOCITY LIMITS TABLE (INCLUDING FUEL FLOW RATES)
PRESSURE: 10000 FT TEMPERATURE: ~25 C

VELOCITY NEVER EXCEED	F.F. (L8S/HR)		863	838	945	1006	1086	1187	1323	1361
VELOCI	VEL (KTS)		160	160	160	160	160	150		701
TANSMISSION LIMITS	F.F.		189	684	684	684	689	700	100	284
TRANSM	VEL (KTS)		146	144	141	138	1 34		net	125
XHZ	F.F.		129	125	729	120	7.29	536	221	729
MA X POWER	VEL (KTS)		150	147	1465	162	2.50	967	1.34	130
snon x	F.F. (L8S/HR)		669	563	599	200	660	659	669	669
CONTINUOUS	VEL (KTS)		147	145	1 42	717	133	1.36	132	127
LONG	F.F. (L85/HR)		488	i or	204	404	505	527	562	209
LORA	VEL (KTS)		122	100	127	177	114	114	114	114
		6 FOSS VEIGHTS		200.40	ann•/	7.500	8 ,000	8•500	00046	9,500

TABLE 4-77

VELOCITY LIMITS TABLE
IINCLUDING FUEL FLOW RATES?
PRESSURE: 10000 FT TEMPERATURE: -5 C

			_	-					
CITY NEVER Exceed	(TB2/HB)		584	909	633	699	720	794	908
VELOCITY EXCEE	VEL (K IS)		E # 19	143	143	143	143	143	143
TRANS FISSION LIMITS	F.F. (L8S/HR)		583	687	587	687	587	687	687
TRANS	VEL (KTS)		155	152	149	145	140	135	126
M AX OWER GINE )	F.F.		611	677	5.17	67.7	617	219	677
MAX POWER (ENGINE)	VEL (KTS)		154	151	148	557	140	134	125
MAX Invous Ower	F = E = CLBS/HR)		616	616	616	919	616	616	616
MAX CONTINUOUS POWER	VEL (KTS)		141	3 # E	161	121	133	126	117
LONG RANGE	F.F. (LBS/HR)		11 ts	164	115	532	295	009	249
71 &	VEL (KTS)		125	125	125	125	124	123	121
	i	GROSS WEIGHTS (LBS)	8+500	7,000	7,500	8 • 000	8 • 500	000 ∙6	9+500

TABLE 4-78

VELOCITY LIMITS TABLE

(INCLUDING FUEL FLOW RATES)

PRESSURE: 10C00 FT TEMPERATURE: 15 C

VELOCITY NEVER EXCEED	2 3 1 13	(KTS) (LBS/HR)			127 468		127 485	127 508	7 536		27 581	77 584		
_		(LBS/HR) (K)			690 12			690 12	690 127	1	630   127	690 127	1	
TRANSMISSION LIMITS	VEL F.	(KTS) (LBS			162	15.7		153	147			131		
MA X OWER STNES	F.F.	(L65/H3)			79¢	562	202	296	582	56.7	200	5 è 5	55.2	700
MAX POWER		(KTS)			£ , ,	141	1	<u>יי</u>	132	123		111	06	7
MAX INUOUS OWER	F.F.	(LBS/HR)		537		537	537		537	537		337	537	
MAX CONTINUOUS POWER		S 43		1 6.1		137	132		127	118	10.	.0.7	7.1	
LONG RANGE	F.F.			4 90		En c	530	Test	926	581	5.74		698	
<b>-1</b> &	VEL			132	15.	757	131	1021	36.4	126	120		119	
		GFOSS	WEIGHTS (LBS)	6 • 500	7.000		7 - 500	8.000		8 500	000 • 6		9.500	

TABLE 4-79

VELOCITY LIMITS TABLE (INCLUDING FUEL FLOW RATES)

PRESSURE: 10000 FT TEMPERATURB: 35 C

Y NEVEI	F.F.	XE / CO	4.10	426	44.8	480	5 30	610	
VELOCITY NEVER Exceed	VEL		110	13.0	110	110	110	110	0
TRANS FISSION LIMITS	F.F.		694	469	694	169	694	469	20.3
TRANSPISS LIMITS	VEL (KTS) (1		16.9	161	159	148	137	124	20%
IX NE J	F.F.		164	491	491	164	491	491	4.9.1
MAX Power (engine)	VEL (KTS)		137	132	126	119	93	-	-
x uous ER	F.F. (LBS/HR)		494	ħ9#	191	464	494	th 9 th	464
MAX CONTINUOUS POWER	VEL (KTS)		130	129	116	106	0	0	0
L ONG R ANGE	F.F. (LBS/HR)		507	521	531	568	598	682	1754
R. 8.	VEL (KTS)		140	139	135	133	125	123	115
		GROSS WEIGHTS (LBS)	6+500	7 • 000	7•500	8,000	8 • 500	9•000	9,500

APPENDIX A FUNCTIONS FOR CALCULATING BASIC FUEL FLOW

There are four functions that can be used to calculate the basic fuel flow for the AH-1G helicopter. In order to use the functions the following data is needed:

- 1. Flight Mode
- 2. Temperature
- 3. Pressure (altitude)
- 4. Gross weight

Which of the four functions will be used depends on the flight mode. The first function is for HIGE (Hover In Ground Effect).

The second function is for HOGE (Hover Out of Ground Effect).

The third function is for NOE (Nap of the Earth).

$$FF(NOE) = f(TEMP, ALT, GW)$$

The fourth function is for Forward Flight.

The equation for FF (HIGE) is:

$$FF (HIGF) = A (ALT) + B (TEMP) + C (GW) + D (ALT) (TEMP) + E (ALT; (GW) + F (TEMP) (GW) + G (ALT) (TEMP) (GW) + K$$

Where ALF is the altitude, TEMP is the temperature and GW is the gross weight and the constants have the following values:

$$A = -1.96834145 \times 10^{-2}$$
  $E = 2.00553615 \times 10^{-6}$ 

$$B = 5.60695611 \times 10^{-1}$$
 F = 3.3810197 X 10⁻⁵

$$C = 4.71104011 \times 10^{-2}$$
  $G = 9.69504943 \times 10^{-9}$ 

$$D = -8.18767749 \times 10^{-5}$$
  $K = 2.0272612 \times 10^{2}$ 

The equation for FF (HOGE) is exactly the same form as FF (HIGE). A new set of values for the constants is used. These values are:

 $A = -2.92590868 \times 10^{-2}$ 

E = 3.54428155 X 10⁻⁶

 $B = 6.0189398 \times 10^{-2}$ 

 $F = 9.28208174 \times 10^{-5}$ 

 $C = 5.73833212 \times 10^{-2}$ 

 $G = 2.65311797 \times 10^{-8}$ 

 $D = -1.7872914 \times 10^{-4}$ 

 $K = 1.82802254 \times 10^{2}$ 

The equation for FF (NOE) is once again the same as FF (HIGE). The new values for the constants are:

 $A = -3.24970242 \times 10^{-2}$ 

 $E = 3.60908763 \times 10^{-6}$ 

 $B = 2.56689422 \times 10^{-1}$ 

 $F = 3.79480189 \times 10^{-5}$ 

 $c = 3.85965109 \times 10^{-2}$ 

 $G = 4.78026205 \times 10^{-8}$ 

 $D = -3.26023186 \times 10^{-4}$ 

 $K = 2.71548943 \times 10^2$ 

For the Forward Flight modes the form of the equation is:

 $FF = A(AS) + B(AS^2) + C(AS^3)$   $(TEMP) + E(GW) + F(ALT) + G(AS^3)(TEMP)$ 

+  $H(AS^2)(TEMP) \div I(AS)(TEMP) + J(AS^3)(GW) + K(AS^2)(GW)$ 

+ L(AS)(GW) + M(AS 3 )(ALT) + N(AS 2 )(ALT) + O(AS)(ALT) + P(TEMP)(GW)

+ Q(TEMP)(ALT) + R(GW)(ALT) + S(TEMP)(GW)(ALT) + T

Where AS is the air speed in kts and the values of the constants are:

 $A = 1.37874198 \times 10$ 

 $K = 1.45717754 \times 10^{-5}$ 

 $B = -1.47026714 \times 10^{-1}$ 

 $L = -1.70559436 \times 10^{-3}$ 

 $C = 5.46789146 \times 10^{-4}$ 

 $M = -1.16014476 \times 10^{-8}$ 

D = 1.4382517

 $N = 3.26539885 \times 10^{-6}$ 

 $E = 6.70538358 \times 10^{-2}$ 

 $0 = -3.30476261 \times 10^{-4}$ 

 $F = -2.60242061 \times 10^{-2}$ 

 $P = 2.1977321 \times 10^{-6}$ 

 $G = -3.5558422 \times 10^{-6}$ 

 $Q = -1.1703294 \times 10^{-4}$ 

 $H = 6.2059176 \times 10^{-4}$ 

 $R \approx 3.51456487 \times 10^{-6}$ 

 $I = -4.42898646 \times 10^{-2}$ 

 $s = 1.87051727 \times 10^{-8}$ 

 $J = -3.18423465 \times 10^{-8}$ 

T = 5.72344971

These functions allow anyone with a simple calculator to figure the fuel flow of the aircraft and bypass both looking up the values and interpolating for points in between the data points in the tables.

The above equations calculate the basic fuel flow for the AH-IG helicopter with the following accuracies:

FF (HIGE) - 99.40%

FF (HOGE) - 98.82%

FF (NOE) - 97.28%

FF (Forward Flight) - 98.79%

## APPENDIX B FUNCTION FOR CALCULATING DELTA FUEL FLOW FOR DRAG

The function below will calculate the delta fuel flow for drag for the AH-1G helicopter. Recall from the discussion in chapter three that this value is added to the basic fuel flow value whenever drag is increasing the rate of fuel flow.*

In order to use the function the following data is needed:

- 1. Air Speed (AS)
- 2. Equivalent Square Footage of Drag (SQ)
- 3. Temperature (TEMP) in degrees centigrade
- 4. Altitude (ALT) in feet above sea level

### That is:

$$FF (Drag) = f(AS, SQ, TEMP, ALT)$$

The equation for FF (Drag) is:

$$FF (Drag) = A(AS) + B(AS^2) + C(AS^3) + D(TEMP) + E(SQ) + F(ALT)$$

$$+ G(AS^3)(TEMP) + H(AS^2)(TEM) + I(AS)(TEMP) + J(AS^3)(SQ) + K(AS^2)(SQ)$$

+ 
$$L(ASYSQ) + M(AS^3)(ALT) + N(AS^2)(ALT) + O(AS)(ALT) + P(TEMP)(SQ)$$

$$+ Q(TEMP)(ALT) + R(SQ)(ALT) + S(SQ)(ALT)(TEMP) + T$$

Where the constants have the following values:

 $J = 1.02981769 \times 10^{-5}$   $T = -1.95841799 \times 10^{-5}$ 

 $I = 3.03757191 \times 10^{-3}$   $S = 1.54490282 \times 10^{-6}$ 

^{*}There is no delta fuel flow for drag for HIGE, HOGE or NOE flight.

This equation calculates the delta fuel flow for drag value with an accuracy of 99.69%. It should be noted that in some instances the computed value will be negative. If this occurs, zero ( $\emptyset$ ) should be used as the value for delta fuel flow.

## APPENDIX C FUNCTION FOR CALCULATING GROUND IDLE FUEL FLOW

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The function below will calculate the ground idle fuel flow rate for the AH-IG helicopter. In order to use the function the following data is needed:

- 1. Temperature (TEMP) in degrees centigrade.
- 2. Altitude (ALT) in feet above sea level.

That is:

FF (Idle) = f (TEMP, ALT)

The equation, for FF (Idle) is:

FF (Idle) = A(TEMP) + B(ALT) + C(TEMP)(ALT) + D(TEMP²) + E(ALT²) + F

Where the constants have the following values:

 $A = 4.31250222 \times 10^{-2}$ 

 $D = 5.20833513 \times 10^{-4}$ 

 $B = -8.81775992 \times 10^{-3}$ 

 $E = -1.11681478 \times 10^{-9}$ 

 $C = 6.49999595 \times 10^{-6}$ 

 $F = 3.90269852 \times 10^2$ 

This equation calculates the ground idle fuel flow rate with an accuracy of 99.98%.

# APPENDIX D FUNCTIONS FOR CALCULATING GROSS WEIGHT LIMITS FOR TAKEOFF

The functions given below will calculate the gross weight limits for take off for the Ah-1G helicopter. Each of the functions is of the same basic form with the values of the constants changing depending on which take off criteria is being used. In all cases the Structural Gross Weight Limit of the AH-1G helicopter is 9,500 lbs.

. In order to use the functions the following data is needed:

- 1. Temperature (TEMP) in degrees centigrade
- 2. Altitude (ALT) in feet above sea level

That is:

The basic equation for GW (Limit) is:

GW (Limit). = 
$$A(TEMP) + B(ALT) + C(TEMP)(ALT) + D$$

For take off criteria #1 the equation must be used twice, once using the engine limit constants and once using the transmission limit constants. For take off criteria #1 the constants for engine limits are:

$$A = -7.85507221 \times 10$$

$$C = 2.08064428 \times 10^{-3}$$

$$B = -3.64956789 \times 10^{-1}$$

$$D = 1.15476464 \times 10^4$$

For take off criteria #1 the constants for transmission limits are:

$$A = -8.88309515$$

$$c = -1.1871431 \times 10^{-4}$$

$$B = -9.71135665 \times 10^{-2}$$

$$n = 9.5892843 \times 10^3$$

For take off criteria #2 two checks must also be made. The constants for engine limits, take off criteria #2 are:

$$A = -7.32945299 \times 10$$

$$c = 1.93157258 \times 10^{-3}$$

$$B = -3.34965002 \times 10^{-1}$$

$$D = 1.06030083 \times 10^4$$

For take off criteria #2 the constants for transmission limits are:

$$A = -7.96285689$$

$$C = -5.34286169 \times 10^{-5}$$

$$B = -8.48471383 \times 10^{-2}$$

$$D = 9.09121887 \times 10^3$$

Also for take off criteria #3 two checks must be made. The constants for engine limits, take off criteria #3 are:

 $A = -9.03973799 \times 10$ 

 $C = 2.3901434 \times 10^{-3}$ 

 $B = -4.19486418 \times 10^{-1}$ 

 $D = 1.32744985 \times 10^4$ 

For take off criteria #3 the constants for transmission limits are:

 $A = -1.01152378 \times 10$ 

 $C = -1.08285753 \times 10^{-4}$ 

 $B = -1.09844279 \times 10^{-1}$ 

 $D = 1.10136713 \times 10^4$ 

This equation with the various sets of constants gives results that are 99.67% accurate or better.

### APPENDIX E

SHORT DESCRIPTION OF AH-1G DATA SOURCE

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DRDAV-EQA(A)

SUBJECT: Short description of AH-1G performance data provided to TRADOC Systems Analysis Activity (TRASANA)

MFR:

#### 1. References:

- a. Engineering flight test, AH-1G Helicopter (Huey Cobra), Phase D, Part 2, final report. USAASTA Proj. No.66-06. Nov 1970.
- b. Determination of the Effects of Rotor Blade Compassibility on the Performance of the UH-1F; FTC-TR-65-17
- c. Letter, DRDAV-PDAO, To: Kaman Aerospace Corp. Subject: Contract DAAJO1-77-C-0317, Basic Data for Use in Preparation of K747-003 Blade, AH-1S (PROD) Operators Manual Performance Charts; 19 Aug 1977.
- d. Operator's Manual, Army Model AH-1G Helicopter, TM55-1520-221-10, Dec. 75.
- e. Operator's Manual, Army AH-1S (Prod) Helicopter, TM55-1520-236-10, Apr 77.
- 2. The performance data presented to TRASANA is the result of combining the helicopter power required, engine power available and engine fuel flow characteristics. The AH-IG, AH-IS (540 blades) and AH-IS (K747 blades) power required was calculated for the required altitude and temperature combinations from a non-dimensional representation of engine power required (coefficient of power) v.s. gross weight (coefficient of thrust) and true airspeed (advance ratio). The non-dimensional engine power required for the AH-1G and AH-1S (540 blades) was extracted from reference la. The drag difference accounted for between the AH-1G and AH-1S (540 blades), was +6.5 ft² equivalent flat plate area. This extra drag of the AH-1S (540 blades) accounts for +2.5 ft² due to the different nose configuration and +4 ft2 due to the flat glass canopy configuration of the AH-1S. The nondimensional engine power required for the AH-1S (K747 blades) was extracted from reference lc. All performance in ground effect represents a 2 foot skid height. A temperature dependent correction, based on the method outlined in reference b., was made to the power required to account for compressibility which could not be accounted for in the non-dimensional representation.
- 3. The T53-L-13 engine power available to the AH-1G (which was used in combination with the power required to find helicopter take-off and speed limits) was used, as a function of altitude and temperature, from reference 1a. The T53-L-703 engine power available to the AH-1S (540 blades) and AH-1S (K747 blades) was calculated for the various altitude and temperature combinations, by the use of the Lycoming T53-L-703 engine specification computer program. Proper engine installation effects were taken into account.

DRDAV-EQA(A)

SUBJECT: Short description of AH-1G performance data provided to TRADOC Systems Analysis Activity (TRASANA)

- 4. The engine fuel flow at a particular altitude and temperature combination was derived from a representative referred fuel flow as a function of referred engine power. The referred fuel flow curve for the T53-L-13 engine (AH-1G), was taken from reference la. The referred fuel flow curve for the T53-L-703 engine (AH-1S) was constructed by use of the Lycoming T53-L-703 engine specification computer program which calculated fuel flows at various engine power levels and atmospheric conditions. The fuel flows were then corrected to reflect 5% conservation. A referred parameter is one which is divided by temperature and pressure ratios in order to represent all atmospheric conditions by one function.
- 5. The never exceed speeds (Vn.e.) were calculated from those shown graphically in references ld and le for the AH-IG and AH-IS respectively.
- 6. The Structural Gross Weight limit of the AH-1G is 9500 lbs. The Structural Gross Weight limit of the AH-1S is 10000 lbs.

JAMES A. O'MALLEY
Aero Engr.

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